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Proceedings

THE

MISCELLANEOUS DOCUMENTS

OF THE

SENATE OF THE UNITED STATES

FOR THE

THIRD SESSION OF THE FORTY-FIFTH CONGRESS,

1878-'79.

IN FOUR VOLUMES.

Volume 1 contains Nos. 1 to 80, inclusive, except Nos. 31, 53, and 59.
Volume 2 contains No. 31.
Volume 3 contains No. 53 and 59.
Volume 4 contains No. 81 and parts.

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INDEX

TO

THE MISCELLANEOUS DOCUMENTS

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THE SENATE OF THE UNITED STATES

FOR THE

THIRD SESSION OF THE FORTY-FIFTH CONGRESS.

VOLUME I..NOS. 1 TO 80, INCLUSIVE, EXCEPT NOS. 31, 53, AND 59.
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45TH CONGRESS, 3d Session. } SENATE. { MIS. DOC. No. 53.

TESTIMONY

TAKEN BY THE

JOINT COMMITTEE

APPOINTED

TO TAKE INTO CONSIDERATION THE EXPEDIENCY OF TRANSFERRING THE INDIAN BUREAU TO THE WAR DEPARTMENT.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1879.

MEMBERS OF THE JOINT COMMITTEE APPOINTED TO TAKE INTO CONSIDERATION THE EXPEDIENCY OF TRANSFERRING THE INDIAN BUREAU TO THE WAR DEPARTMENT.

On the part of the Senate.

Hon. ALVIN SAUNDERS, of Nebraska, Chairman.
Hon. R. J. OGLESBY, of Illinois.
Hon. THOMAS C. MCCREERY, of Kentucky.

On the part of the House of Representatives.

Hon. ALFRED M. SCALES, of North Carolina.
Hon. ANDREW R. BOONE, of Kentucky.
Hon. CHARLES E. HOOKER, of Mississippi.
Hon. NELSON H. VAN VORHES, of Ohio.
Hon. JACOB H. STEWART, of Minnesota.

ORGANIZATION OF THE JOINT SPECIAL COMMITTEE TO CONSIDER THE FEASIBILITY OF TRANSFERRING THE INDIAN BUREAU TO THE WAR DEPARTMENT.

Pursuant to section 14 of the bill making appropriations for the Army, for the year ending June 30, 1879, the President of the Senate, in June, 1878, appointed Senators Oglesby of Illinois, Saunders of Nebraska, and form McCreery of Kentucky, the committee on the part of the Senate, to a joint committee to consider the feasibility of transferring the Indian Bureau to the War Department.

The Speaker of the House appointed Hon. A. M. Scales of North Carolina, A. R. Boone of Kentucky, Charles E. Hooker of Mississippi, J. H. Stewart of Minnesota, and N. H. Van Vorhes of Ohio, the committee on the part of the House.

THE AUTHORITY.

The following is the section of the bill above referred to, giving the authority to form said joint committee:

SECTION 14. That three Senators, to be appointed by the President of the Senate, and five Representatives, to be appointed by the Speaker of the House, are hereby constituted a joint committee, who shall take into consideration the expediency of transferring the Indian Bureau to the War Department. Said committee shall be authorized to send for persons and papers, to employ a clerk and stenographer, and to sit during the recess of Congress. It shall be the duty of said committee to make a final report to Congress on or before the 1st day of January, 1879. And the sum of five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, to defray the expenses of said committee, to be expended under the direction of the chairman thereof.

FIRST MEETING OF THE COMMITTEE.

Pursuant to this fourteenth section, above given, the committee met in Washington on the 20th day of June, 1878, the day subsequent to the adjournment of Congress.

Senator Oglesby having left for his home in Illinois, Senator Saunders was called to the chair *pro tem.*, and Charles L. Flanagan was chosen clerk of the committee *pro tem.*

The committee held sessions on the 20th, 21st, and 22d. They agreed on certain letters to be addressed to the Secretaries of War and Interior, gave instructions to the clerk what duties to perform during the interval, and then adjourned to meet on the 25th of September, either in Washington or Saint Louis, as might subsequently be agreed upon by the entire committee.

[Below are given the letter of instruction to the clerk and the letters addressed to the War and Interior Departments, with the answers thereto, and other accompanying documents.]

MEETING IN SAINT LOUIS.

Agreeably to the unanimous wish of the members, the chairman *pro tem.* ordered the meeting for the 25th of September to be convened at

Saint Louis, and accordingly on that day the joint committee there assembled.

Senator Oglesby having signified his inability to attend, on motion of Hon. A. R. Boone, of Kentucky, Senator Alvin Saunders, of Nebraska, was chosen permanent chairman, and Charles L. Flanagan was elected permanent clerk.

The session continued in Saint Louis from the 25th of September until October 2, during which time a number of witnesses were examined (their testimony in full being given below).

THE INDIAN TERRITORY, SOUTHERN MISSOURI, AND TEXAS.

On October 2 the committee left Saint Louis for Southern Missouri, the Indian Territory, and Texas. They visited Vinita, Muskogee, Eufaula, Atoka, and other prominent places in the Indian Territory; Denison, Dallas, Fort Worth, and other points in Texas; and returning, visited Seneca, Mo., near which, on reservations, they visited the Modocs and Nez Percés, the latter under Jerry or Chief Joseph. While in the Indian Territory the committee held numerous consultations with the chiefs, governors, and people, and in Texas gleaned much information on the subject of their inquiry.

At Seneca they heard the statements of all the chiefs of the tribes in that locality, besides making personal inspection of the Modoc farms and the Nes Percés camp.

The various and voluminous testimony received on their visit will be found in full in this report.

The committee proceeded from Seneca to Saint Louis, and thence to Omaha, Nebr., where they arrived on the 10th of October. Here they heard the testimony of General Crook, General Williams, Colonel Furey, Lieutenant Lee, and other important witnesses, all of which is given below.

The committee left Omaha on October 15, and proceeded to the Omaha and Winnebago Agencies, in Nebraska. They visited Tekama, Decatur, the Omaha Agency and Reservation, and then the Winnebago Agency and Reservation. They held interesting councils with the Omahas, hearing the testimony of Fire Chief, Lion, White Horse, Inbahowba, the Indian agent, and others.

At the Winnebagoes they held councils and heard the testimony of Chief White Breast, Aleck St. Cyr, John Buller, Indian Agent Howard White, and others.

Returning, they reached Omaha on the 18th, and left there on the morning of the 20th for Wyoming, Utah, Nevada, and California.

At Camp Douglas, near Salt Lake City, the committee heard the testimony of General John E. Smith, and several of the officers at Camp Douglas, who had had long and varied experience with the Indians.

At San Francisco, Santa Rosa, Cloverdale, Presidio, and other points on the Pacific slope and in the West, the committee received important testimony and much valuable information, all of which is subjoined as testimony in accompanying documents.

Returning East, the committee reached Omaha Sunday, November 10. On Monday, November 11, they met, and adjourned to meet in Washington on Tuesday, November 26.

MEETING IN WASHINGTON.

The committee met in joint session (pursuant to adjournment in Omaha) in the rooms of the Senate Committee on Indian Affairs, on Tuesday,

the 26th day of November, and proceeded to take further testimony, which they did, from day to day, until December 12. The testimony thus taken is subjoined.

The committee then adjourned until called by the chairman to consider the nature of the report to be presented.

EXECUTIVE SESSIONS.

All subsequent meetings of the committee were of an executive nature. The reports, accompanying documents, and testimony are herewith subjoined.

True copy.

CHAS. L. FLANAGAN,
Clerk of Joint Committee, etc.

ACCOMPANYING PAPERS.

LETTER OF INSTRUCTION TO SECRETARY OF THE JOINT COMMITTEE.

UNITED STATES SENATE CHAMBER,
Washington, June 22, 1878.

SIR: You will devote your time, until further orders, to the obtaining from the War and Interior Departments all information that may be of service to the committee. Inform each member by official letter of the proceedings thus far, and forward to them copies of the answers received from the departments, and the data contained therein Obtain for the members of the committee, upon their verbal or written request, any data desired, and at once forward the same to their address. Preserve all communications, papers, and records, and lose no opportunity to collect any facts or figures, *pro* and *con*, from every available source, pertaining to the subject of the committee's inquiry. The proceedings must be kept secret, and contemplated visits to any particular section, either by subcommittee or as a whole, must not be made known. You will keep a full and accurate record of the proceedings, and the sending and receiving of all communications. You will also be subject to the personal direction and orders of the chairman.

Very respectfully,

A. SAUNDERS,
Chairman.

CHAS. L. FLANAGAN,
Secretary Joint Committee.

JOINT LETTERS TO THE SECRETARIES OF WAR AND THE INTERIOR.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: The joint committee to consider the expediency of transferring the Indian Bureau to the War Department respectfully request that Chas. L. Flanagan, clerk of said committee, may receive from yourself and the officers of the department every possible information, verbally and in writing, that may aid him in obtaining all reports, statements, statistics, &c., required by said committee.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON. SECRETARIES OF WAR AND INTERIOR.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: I have the honor to inform you that the joint committee to consider the expediency of transferring the Indian Bureau to the War Department respectfully request that you furnish them with all data to be obtained in your department which may in any way facilitate or be of advantage to the prosecution of their investigations and inquiries. You will please forward all such communications to Chas. L. Flanagan, clerk of the committee, United States Senate, Washington, D. C.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON. SECRETARIES OF WAR AND INTERIOR.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: Please have prepared for our information all data obtainable in or through your department, relating exclusively to the hostile tribes, including their numerical strength; how many warriors they have, or may be able to get into the field; and, in fact, all the facts and figures that can be obtained on this subject.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON SECRETARIES OF WAR AND INTERIOR.

LETTERS TO THE SECRETARY OF THE INTERIOR.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: Please have prepared for the use of this committee the names of the Indian tribes; their respective numbers, location, and extent of land they hold and occupy; their present condition, and the facts, if any, upon which may be based their prospective improvement. Have stated in this paper the amount of moneys or supplies due each of these tribes, up to date. Also, the number of agencies or subagencies that are attached to each tribe; the location of said agencies; names of the agents and their salaries; and all facts and figures relating to the expenses of these agencies, including pay of interpreters, &c.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON. CARL SCHURZ,
Secretary of the Interior.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: Please have prepared for our information all data obtainable in or through your department relating exclusively to the hostile tribes, including their location numerical strength, causes of defection, and the probabilities of a peaceful solution, and how this may be accomplished.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON. CARL SCHURZ,
Secretary of the Interior.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: The joint committee to consider the expediency of transferring the Indian Bureau to the War Department respectfully request that you have prepared for their use a statement of the numbers of officers, clerks, messengers, and other employés of the Indian Bureau. It is suggested that this statement be based upon the organization and pay-rolls for the fiscal year commencing the 1st of July, 1878.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

HON. CARL SCHURZ,
Secretary of the Interior.

LETTERS TO THE SECRETARY OF WAR.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: Please have prepared for the use of this committee a statement of the cost of transportation of supplies, &c., to the various Indian agencies, either by railway, steam-

boat, wagon-transportation, or otherwise, under the War Department; also the cost of transporting troops in the same connection.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

Hon. G. W. McCRARY,
Secretary of War.

HOUSE OF REPRESENTATIVES,
Washington, D. C., June 22, 1878.

SIR: I have the honor to request that you cause to be prepared, for the use of this committee, a statement of the number of officers and troops stationed at the various Indian agencies, at the frontier forts, in the field against hostile Indians, and all other data in this regard that you can supply, including the estimated outlay of moneys for the same; also estimates of the expense of conducting the Indian Bureau under the direction of the War Department, and abstracts of the correspondence that has taken place between the Interior and War Departments on this subject.

Very respectfully,

A. SAUNDERS,
Chairman Joint Committee Indian Bureau Transfer.

Hon. G. W. McCRARY,
Secretary of War.

LETTERS AND REPORTS FROM THE WAR DEPARTMENT.

WAR DEPARTMENT,
Washington City, August 21, 1878.

SIR: I have the honor to transmit herewith reports on the subject of the transfer of the Indian Bureau to the War Department, in response to the letter from the chairman of the joint commission on the Indian Bureau transfer, dated June 22, 1878.

These consist of reports from the inspector-general, the Departments of California, the Columbia, and Arizona, embraced in the Military Division of the Pacific, and the Departments of Texas and the Missouri, and the Platte, embraced in the Military Division of the Missouri.

I also inclose notes of the Adjutant-General upon the subject, dated May 15, 1875.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

CHAS. L. FLANAGAN, Esq.,
Secretary of the Joint Commission on the Indian Bureau Transfer.

HEADQUARTERS MILITARY DIVISION OF THE
PACIFIC AND DEPARTMENT OF CALIFORNIA,
Presidio of San Francisco, Cal., July 15, 1878.

SIR: In reply to your telegram of July 2, asking for information to be furnished the Joint Committee on transferring the Indian Bureau to the War Department, I have to state that at Hoopa Valley Indian Agency, which is on the military reservation of Camp Gaston, Cal., there are 4 commissioned officers and 36 enlisted men.

At Angel Island, Benicia Barracks, Presidio of San Francisco, Fort Point San José, in the harbor of San Francisco, and San Diego, Cal., which are as much frontier posts as Camp Bidwell, Cal., Camp Halleck, and Camp McDermitt, Nev., inasmuch as during the three Indian wars which have occurred in this division since 1873, the Modoc, the Nez Percé, and the Bannock, and the Sioux campaign of 1876, the troops thereat have participated, the regular garrisons consist of 48 commissioned officers and 699 enlisted men.

In the field against the hostile Indians at this time there are from the posts in this department 38 commissioned officers and 576 enlisted men.

The only troops in the department not in the field or otherwise employed against hostile Indians are 4 commissioned officers and 36 enlisted men at Camp Gaston, Cal.; 5 commissioned officers and 76 enlisted men at Alcatraz Island, Cal., where there are 81 general prisoners undergoing sentences of hard labor.

I inclose reports from the commanding officers departments of the Columbia and Arizona.

Very respectfully, your obedient servant,

IRVIN McDOWELL,
Major-General, Commanding Division and Department.

The ADJUTANT-GENERAL UNITED STATES ARMY,
Washington, D. C.

HEADQUARTERS DEPARTMENT OF THE COLUMBIA,
Fort Vancouver, Wash., July 8, 1878.

SIR: In compliance with your telegraphic instructions of the 5th instant, I have the honor to make the following report of officers and enlisted men stationed at Indian agencies in this department, and also the number of troops now in the field against hostile Indians. For obvious reasons I can, in the latter instance, only give the number of those properly belonging to this department:

Statement of troops stationed at Indian agencies.

Agency.	Officers.	Enlisted men.	Aggregate.	Date.
Colville (Fort Colville, Wash.)	4	93	97	May 31, 1878
Cœur d'Alene Reservation (Camp Cœur d'Alene, Ind. T.)	11	135	146	May 31, 1878
Malheur (Camp Harney, Oreg.)	6	102	108	May 31, 1878
Lapwai (Fort Lapwai, Idaho)	9	172	181	May 31, 1878
Lapwai (Camp Howard, Idaho)	5	55	60	May 31, 1878
Klamath (Fort Klamath, Oreg.)	5	101	106	May 31, 1878
Total	40	658	698	

Statement of troops pertaining to Department of the Columbia in the field against hostile Indians.

Organization.	Company.	Officers.	Enlisted men.	Aggregate.	Date.
First Cavalry	A	2	62	64	May 31, 1878
	E	2	52	54	May 13, 1878
	F	2	40	42	June 4, 1878
	G	3	58	61	May 30, 1878
	H	2	57	59	May 31, 1878
	K	2	64	66	May 30, 1878
	L	2	41	43	June 4, 1878
		1	58	59	May 31, 1878
Fourth Artillery	A	1	27	28	June 20, 1878
	D	3	31	34	June 4, 1878
	G	1	30	31	June 4, 1878
	M	2	30	32	June 10, 1878
Second Infantry	F	2	31	33	June 4, 1878
Twenty-first Infantry	A	2	27	29	May 31, 1878
	B	2	26	28	June 5, 1878
	C	1	18	19	June 17, 1878
	D	1	26	27	June 5, 1878
	E	2	32	34	June 6, 1878
	G	3	30	33	June 5, 1878
	H	2	28	30	June 5, 1888
	I	2	28	30	June 5, 1878
	K	3	38	41	June 5, 1878
Department commander, staff, and detachments	.....	11	43	54	
Total	.....	54	877	931	

Concerning the statement of troops stationed at Indian agencies, it is proper to add the following:

Camp Cœur d'Alene is located upon the Cœur d'Alene Reservation, to which is attached no agency.

Camp Harney is upon the Malheur Reservation, though it is fifty miles from the agency itself.

Camp Howard, Idaho, is sixty miles from the agency, but is on the borders of the Nez Percé Reserve.

Forts Colville, Lapwai, and Klamath are within three or four miles of the agencies.

Referring to number of troops in the field against hostile Indians, those given in this report are only such as have been officially reported as such, but at present time troops from other posts are *en route* to the scene of hostilities, of whose movements this office has as yet no official reports.

With the single exception of one company of infantry at Klamath, all troops in this depar ment may be said to be at the present time engaged in active operations.

Very respectfully, your obedient servant,
In the absence of the department commander:

J. A. SLADEN,
Acting Assistant Adjutant-General.

The ASSISTANT ADJUTANT-GENERAL,
Military Division of the Pacific, Presidio of San Francisco, Cal.

HEADQUARTERS DEPARTMENT OF ARIZONA,
Prescott Barracks, July 6, 1878.

SIR: In reply to your telegram of the 5th instant, calling for a report of officers and troops stationed at Indian agencies, &c., I have the honor to report that there are belonging to this department 80 commissioned officers and 1,228 enlisted men, all of whom may be regarded as on Indian service. This includes four companies of Indian scouts which are used in operating against hostiles and recapturing renegade Indians.

Of this force 6 officers and 112 men are stationed at Camp Thomas, guarding the San Carlos Indian Agency. There are, in addition, three posts which may be said to stand guard over the San Carlos Reservation, viz, Camp Apache, 8 officers and 213 men; Camp McDowell, 6 officers and 92 men; and Camp Verde, 8 officers and 128 men. The strength of these posts is given as of date May 31, one company from each of the posts of Camps McDowell and Verde having been transferred to the Department of California, and not yet replaced. Nearest to the Papagoes is the post of Camp Lowell; the troops, consisting of 5 officers and 30 men, as of date May 31, are now absent, not having been replaced. These, together with those at Camp McDowell, also guard the Pima and Maricopa Agency, which is near Phœnix.

The troops stationed at Bowie, Grant, and camp near old Camp Wallen, consisting of 21 officers and 433 men, are operating against hostile Chiricahua Indians. The troops at Fort Yuma, 1 officer and 15 men, and at Camp Mojave, consisting of 2 officers and 34 men, guard the Colorado River Indians (agency near La Paz); and those of Mojave, with the troops at Fort Whipple, consisting of 9 officers and 124 men, stand guard in addition over the Hualapais, who left their agency in 1875, the Cerbats and some Piutes, who stray from Nevada and Utah; while for the whole northern tribes, Hualapais, Moquis, Cervents, Casinos, and Navajos, is a line of four posts, viz, Mojave, Whipple, Verde, and Apache.

The strength of the three companies, together with one at San Diego, which were transferred to the Department of California, is 12 officers and 160 men, leaving total strength present 68 officers and 1,068 men, according to latest returns on Indian service.

None of the troops are kept actually *at* any one of the agencies, for reasons which are considered politic and wise both to the Military and Indian Departments.

As a *résumé* and strict answer to the two queries in yesterday's dispatch, I have the honor to say that six (6) officers and 112 men are on duty at or near agencies, and twenty-one (21) officers and 433 men are operating against hostile Indians. The balance of troops in this department are on duty to keep the Indians within their proper limits.

Very respectfully, your obedient servant,

O. B. WILLCOX,
Colonel 12th Infantry, Brevet Major-General (Assgd.), Commanding Department.

ASSISTANT ADJUTANT-GENERAL,
Military Division of the Pacific, San Francisco, Cal.

HEADQUARTERS DEPARTMENT OF THE PLATTE,
Omaha Barracks, Nebr., August 5, 1878.

SIR: In compliance with the instructions of the Lieutenant-General, contained in a telegram from your office, dated the 2d ultimo, I have the honor to submit the following statement:

Number of troops stationed at Indian agencies, 23 officers, 350 enlisted men, 1 Indian scout. Number of troops stationed at frontier posts, 103 officers, 1,446 enlisted men. Number of troops in field against hostile Indians, 40 officers, 669 enlisted men, 29 Indian scouts. Total, 166 officers, 2,465 enlisted men, 30 Indian scouts.

The estimated outlay for these troops for this fiscal year is $2,539,212.85.

I inclose the reports of the staff officers at these headquarters from which the above statement is compiled.

Very respectfully, your obedient servant,

GEORGE CROOK,
Brigadier-General, Commanding.

The ASSISTANT ADJUTANT-GENERAL,
Headquarters Military Division of the Missouri, Chicago, Ill.

[First indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, August 8, 1878.

Respectfully forwarded to the Adjutant-General of the Army.
In the absence of the Lieutenant-General commanding:

WM. D. WHIPPLE,
Assistant Adjutant-General.

HEADQUARTERS DEPARTMENT OF TEXAS,
San Antonio, Tex., July 15, 1878.

SIR: Referring to the telegram of the 2d instant, calling " * * * for statement of number of officers and troops stationed at the various Indian agencies, * * * and all other data in this regard that can be supplied, including the estimated outlay of moneys for the same" * * * , I have the honor to report that there are not any Indian agencies in the Department of Texas.

There are some Tonkawa Indians located, without an agent, near Fort Griffin. As to them, the commanding officer of that post reported, April 14, 1878, that they were not, and had not for several months, been supplied with rations by the Indian Bureau—there being about 115 of all ages; that some of the families were provided for, to a certain extent, by allowing them to go out after buffalo and other game; that they were thus exposed to the danger of being taken by hunters and stock men for hostiles, and liable to attack, also liable to create false alarms as to hostile Indians about the settlements; that there was an appropriation for their support, but, there being no agent, it had not been available; that they were suffering, especially the old, and squaws not claimed by any head of family; that some had died from starvation; that supplies for their immediate wants could be had at the post if funds were available; and that if a supply of beef and flour could be obtained, it would be a great help to them.

That report was, April 19, 1878, forwarded through headquarters Military Division of the Missouri to the War Department.

In forwarding it the department commander said, "This matter (if there is an appropriation for the support of the Indians) is a great shame, and, for its credit, should promptly be attended to by the Indian Bureau.

May 6, 1878, the commanding officer Fort Griffin reported that he had notice of a credit of $2,500 for the Tonkawa scouts' case, and asked if he could purchase from the Subsistence Department some of the hard bread, bacon, and hominy in excess of wants of command, at invoice price.

He was authorized to so purchase.

I am, sir, very respectfully, your obedient servant,

THOMAS M. VINCENT,
Assistant Adjutant-General, in the absence of the Department Commander.

The ADJUTANT-GENERAL,
Military Division of the Missouri, Chicago, Ill.

[First indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, July 19, 1878.

Respectfully forwarded to the Adjutant-General of the Army.
In the absence of the Lieutenant-General commanding:

WM. D. WHIPPLE,
Assistant Adjutant-General.

Statement of average number of officers and troops stationed at, or in the vicinity of, the several Indian agencies in the Department of Dakota, for one year or parts thereof, together with report of estimated outlay of moneys therefor.

Post or station.	No. of officers and troops.		Expenses of the Quartermaster's Department.	Time (average).	Expenses of the Subsistence Department.	Time.
	Officers.	Men.				
Fort Sisseton	2	47	$4, 942 02	One year..	$4, 473 45	One year.
Fort Totten.....	11	183	24, 754 30	... do	10, 959 43	Do.
Fort Stevenson	6	108	14, 025 84	....do	7, 488 67	Do.
Standing Rock agency	27	297	38, 177 08	....do	18, 017 67	Do.
Cheyenne agency ...	21	225	44, 383 83	....do	9, 254 22	Do.
Lower Brulé agency .	4	69	13, 352 55	....do	7, 446 61	Do.
Red Cloud agency ...	7	136	17, 896 22	....do	8, 409 39	Dec. 1, 1877, to June 30, 1878.
Spotted Tail agency..	4	131	17, 404 17	....do	5, 529 58	Nov. 1, 1877, to June 30, 1878.
Total	82	1, 196	174, 936 01		71, 579 02	

JOHN GIBBON,
Colonel Seventh Infantry, commanding.

HEADQUARTERS DEPARTMENT OF DAKOTA,
Saint Paul, Minn., September 11, 1878.

Official copy.

ADJUTANT-GENERAL'S OFFICE,
September 21, 1878.

E. D. TOWNSEND,
Adjutant-General.

Tabular statement of the number of officers and enlisted men at the several independent posts operating against hostile Indians in the Department of the Missouri.

Stations.	Number of companies.		Commissioned officers.							Enlisted men.										Remarks.	
	Cavalry.	Infantry.	Regimental field-officers.	Quartermaster's Department.	Medical Department.	Post chaplains.	Captains.	Subalterns.	Acting assistant surgeons.	Non-commissioned staff of regiments.	Ordnance sergeants.	Commissary sergeants.	Hospital stewards.	Sergeants.	Corporals.	Musicians.	Artificers, wagoners.	Farriers and blacksmiths.	Privates.		
Fort Dodge, Kansas	.....	3	1	....	1	...	3	7	1	....	1	1	1	13	10	3	....	...	81	Aggregate strength of post	122
Fort Elliott, Texas	2	2	1	....	1	....	4	8	1	...	...	1	1	22	13	8	..	6	141	Aggregate strength of post	206
Fort Gibson, Indian Territory	.....	1	...	....	1	1	1	2	....	....	...	1	1	5	4	2	1	....	23	Aggregate strength of post	42
Fort Hays, Kansas	.....	1	...	....	....	....	1	2	1	....	1	1	1	5	1	2	....	....	25	Aggregate strength of post	39
Fort Larned, Kansas	.....	1	..	....	1	1	1	1	1	....	1	1	1	5	4	2	....	....	30	Aggregate strength of post	48
Fort Lyon, Colorado	.....	3	1	....	1	....	3	7	...	5	1	1	1	13	10	6	....	....	109	Aggregate strength of post	*158
Fort Reno, Indian Territory	2	2	1	...	1	....	4	8	1	...	....	1	1	21	15	7	4	5	155	Aggregate strength of post	†223
Fort Sill, Indian Territory	4	2	1	1	1	....	6	13	1	....	1	1	1	28	18	15	7	7	249	Aggregate strength of post	‡349
Camp Supply, Indian Territory	1	2	1	...	1	....	3	6	1	....	1	1	1	16	9	4	3	....	105	Aggregate strength of post	§151
Fort Wallace, Kansas	.....	1	....	....	1	1	1	2	..	...	1	1	1	4	4	2	....	...	25	Aggregate strength of post	43
Total	9	18	6	1	9	3	27	56	7	5	7	10	10	132	88	51	15	18	943		1,781

* Including band.

† Cheyenne and Arapahoe agency.

‡ Kiowa and Comanche agency.

§ Not including 3 Indian scouts.

Tabular statement of the number of officers and enlisted men at the posts in the district of New Mexico, Department of the Missouri, operating against hostile Indians.

Stations.	Number of companies.		Commissioned officers.								Enlisted men.									Aggregate strength of posts.	Remarks.
	Cavalry.	Infantry.	Regimental field officers.	Quartermaster's Department.	Subsistence Department.	Medical Department.	Post chaplains.	Captains.	Subalterns.	Acting assistant surgeons.	Non-commissioned staff of regiments.	Ordnance sergeants.	Commissary sergeants.	Hospital stewards.	Sergeants.	Corporals.	Musicians.	Artificers, wagoners, farriers, and blacksmiths.	Privates.		
Fort Bayard, New Mexico	4	1	1	....	....	1	....	5	10	1	....	1	1	1	18	14	8	7	97	164	
Fort Bliss, Texas	1	1	....	....	....	....	....	2	4	1	....	....	1	1	7	2	4	3	57	81	
Fort Craig, New Mexico	.....	2	....	....	....	1	....	2	3	1	....	1	1	1	8	5	2	....	53	77	Southern Apache agency.
Fort Garland, Colorado	1	1	....	....	....	1	....	2	4	....	....	....	1	1	9	7	4	3	56	88	Los Penos.
Fort Marcy, New Mexico	.....	1	....	....	....	....	....	1	2	1	....	....	....	1	5	3	2	....	26	40	Pueblo agency.
Fort Selden, New Mexico	.....	.....	....	....	....	....	....	....	1	....	....	....	1	....	1	....	..	....	5	1	Lieutenant Cory, 1 sergeant, and 5 privates on temporary duty.
Fort Stanton, New Mexico	3	1	1	....	....	1	....	4	8	1	....	....	1	1	22	13	8	7	93	159	Mescalero agency.
Fort Union, New Mexico	2	1	1	1	....	1	1	3	6	1	....	....	1	1	15	9	6	6	77	127	Cimarron agency.
Fort Wingate, New Mexico	1	2	1	....	....	1	....	3	8	....	4	....	1	1	14	9	4	2	96	144	Navajo agency.
Total	12	10	4	1	....	6	1	22	45	6	4	2	8	8	98	62	38	28	555	881	

ADDITIONAL REMARKS.

FORT BAYARD.—The band, Ninth Cavalry, temporarily attached for duty Companies A, B, and G, Ninth Cavalry, on temporary duty at Fort Bliss, Texas.
FORT CRAIG.—Furnishes detachments to guard public property at Forts Selden and McRae, New Mexico.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
Fort Leavenworth, Kansas, July 11, 1878.

Official:

E. R. PLATT, *A. A. General.*

HEADQUARTERS OF THE ARMY,
INSPECTOR-GENERAL'S OFFICE,
Washington, D. C., July 25, 1878.

SIR: In compliance with the order of the Secretary of War, received through your office on the 4th instant, I have the honor to state that I have not the data for supplying the information called for concerning the number of troops connected with Indian affairs, but I have given herein a statement of facts bearing upon the subject of the transfer of the Indian Bureau to the War Department, which may be of some service to the Joint Commission on Indian Bureau transfer; and, in this connection, I remark that many years of military service upon the Western frontier, where I came in contact with many different tribes of Indians and their agents, have impressed me with the conviction that whatever modifications the future exigencies of the Indian Department may necessitate, it is manifest, as will be seen from the annual report of the Commissioner of Indian Affairs for 1876, that the atmosphere which for a long time has shrouded the transactions of the subordinate *personnel* of that department has become so thoroughly impregnated with corruption that it is difficult to conceive of any change that would not tend to disinfect it.

The Commissioner, in the report referred to, says:

"The records are abundant to show that agents have pocketed the funds appropriated by the government, and driven the Indians to starvation.

"It cannot be doubted that Indian wars have originated from this cause.

"We do not doubt that some such men may be found in the bureau now."

A great deal has been asserted by the champions of the existing policy in its favor, and its advantages over that of transferring the management of the bureau to the War Department, and these men have endeavored to sustain their opinions by the asseveration that the working of their system will educate, civilize, and christianize the savages, and is already rapidly eradicating their nomadic proclivities, and teaching them the rudiments of husbandry, so that they are in a fair way of becoming self-supporting; whereas, in their opinion, the War Department management would not conduce to such happy results.

If these plausible averments were true, this reasoning would possess cogency, but that the facts do not sanction any such conclusions, I proceed to show.

In the report of a commission sent out in 1876 to negotiate with the Sioux for the relinquishment of the Black Hills country, on page 12, I find the following:

"For reasons just stated, and for others equally obvious to any one who will visit that country, no progress whatever has been made toward civilization or self-support at either of these agencies (those of Red Cloud and Spotted Tail, containing 20,000 Indians), or among the tribes receiving their rations and annuities, during the last six years.

"During those six years, whatever of food or shelter they have had has been provided by appropriations from the national Treasury (over $2,000,000 per annum), and the Indians have done absolutely nothing but eat, drink, smoke, and sleep.

"It occurs to the commission that so large an annual expenditure with such feeble results is expensive and unremunerative to the United States and to the Indians, and so long as the present methods continue, very large annual expenditures will be required, unless better methods for issuing supplies should be adopted.

"Nearly seven years have passed away, and these Indians are no nearer a condition of self-support than they were before, and in the mean time the government has expended $13,000,000 for their support."

The opinion of this commission as to the wisdom of continuing the existing policy of the Indian Bureau may be inferred from the following extracts from page 18 of their report:

"The commission recommend, * * * 4th, that all supplies be issued under the direct supervision of officers of the Army, and that detailed reports of quantity and quality and cost be published annually."

In this recommendation, the Secretary of the Interior, in his annual report for that year (page 9), says he cannot refrain from concurring, and adds: "The thanks of this department are due the War Department, and the officers of the Army, for the prompt and efficient aid they have rendered during the year in the management of Indian affairs throughout the country, and for their hearty co-operation and advice whenever called upon to render assistance in carrying out the details of the Indian policy."

The commission before alluded to also recommended:

"5th. Abolish all the present agencies, and reorgnize the whole system." * * *

Such are the conclusions reached by a commission composed of disinterested and intelligent gentlemen, after a careful investigation into the management and condition of the most powerful tribe of Indians within our territory.

If any more direct evidence were required to substantiate the frequent charges of malfeasance in office that, from time to time, have been made against Indian agents, contractors, and others, connected with the purchase and distribution of goods and supplies, and the payment of annuities, the fact that numerous instances, it is believed,

might be adduced showing that many of these agents on entering on the performance of their functions were poor, and at the expiration of four years retired with considerable fortunes accumulated from salaries of only $1,500 a year, and without any other apparent means far accomplishing such a result, would be sufficient to convince the most skeptical that great peculations and frauds have been perpetrated under the present policy. Any other solution of the financial problem above enunciated would, in the judgment of the undersigned task the ingenuity of the most astute mathematician.

The most untutored Indians we have are cognizant of these facts, and that great dissatisfaction has been engendered thereby, and that many of our recent Indian difficulties may be traced directly to this cause, does not admit of a question.

I served from 1833 to 1849 in the Indian country, while the Indian Bureau was under the War Department, and, as I before remarked, came in direct contact with different tribes, and during this period I was present at many different payments of annuities and issues of goods to the Indians by Army officers. These disbursements were generally made in the immediate vicinity of military posts, and supervised by the commanders of such posts, and in presence of nearly all the officers, every one of whom knew the amount coming to each individual under the allotment, and the receipt of every head of a family was taken and witnessed by another officer who saw the transaction; so that had the disbursing officer been disposed to act dishonestly he would have been detected by other officers present. Besides, the officer's reputation, his commission, and the means of support of himself and family, were at stake, all affording ample guarantee against dishonesty.

The result of this system was what might have been anticipated, as it is doubted if a single instance can be cited where, previous to the transfer of the bureau to the Interior Department in 1849, anything was ever withheld from the Indians by Army officers, whereas ever since the transfer continual complaints have been made of fraudulent dealings on the part of agents and contractors.

The measure of returning this bureau to the control of the War Department has long been indicated as expedient and wise, and it has several times passed the House of Representatives, and been recommended by Secretaries of War.

For the reason that the duties involved would be arduous and thankless, no matter how faithfully they might be discharged, the transfer is not seriously desired by the Army.

Whatever may be said to the contrary by the opponents of the change, the Army officer is the last person who wants an Indian war, for he has nothing to gain thereby; but his experience in Indian affairs is great, his probity unquestioned, and his influence has doubtless been most salutary with the Indians, for they know he never deceives them; and the only motive he could have for undertaking the gratuitous task of Indian agent, were it left to his option, would be for the preservation of peace and tranquillity.

Some of the Western tribes are now hostile, and others, like the powerful bands of Sioux, are still so unsettled in their condition upon reservations, and so haughty and defiant, that should the slightest spark of dissatisfaction find its way to their inflammable, warlike proclivities, it might, in the absence of a suitable military force, bring on hostilities that would devastate the entire frontier settlements.

This is no visionary speculation upon remote or improbable contingencies, but a condition of affairs continually imminent and liable to occur at any moment, provided great circumspection is not exercised in the management of these people.

That the transfer of the Indian Bureau to the War Department would prove a measure of economy, no one pretends to raise a question.

Commanders of military posts and other Army officers, including many of the retired officers, could perform all the duties of agents; department commanders act as superintendents; quartermasters and commissaries purchase and issue all goods, using the same means of transportation and undert he same safe system of accountability that is now required in the Army, and with but little additional clerical force. Medical officers serving with the troops adjacent to the reservations could supply much of the aid required in sickness, and the inspector-general's department could efficiently inspect the entire management. All this might be done without any addition to the pay of the officers, and, as they are subject to military law, any dereliction of duty or violation of trust would speedily be detected and summarily punished.

But the preponderating advantage that would be reached by the transfer would arise from the attainment of a greater unity of purpose and the doing away with the evils and perplexities consequent upon the present dual management.

This division of authority in administering Indian affairs certainly affects the question seriously; as, for example, a military post may be established in the vicinity of an Indian agency for the protection of Indian officials, and soon after the buildings are completed the agent may think proper to change the location of the agency to some other point, thereby necessitating new buildings not only for the ageney, but for the troops.

A case was reported to one of the officers of my department where an agent of the

Apaches in Arizona, for reasons best known to himself, removed his agency as far from a contiguous military post as he deemed it consistent with his own personal safety, and ordered all the buildings, valued at $20,000, to be burned to the ground as soon as the Indians left. At the same time he knew that the lumber was greatly needed for repairing the quarters at the adjacent post.

The Commissioner of Indian Affairs, in the report before alluded to, says:

"We have the highest possible appreciation of the officers of the Army, and fully recognize their proverbial integrity and honor; but we are satisfied that not one in a thousand would like to teach Indian children to read and write, or Indian men to sow and reap."

This reasoning is eminently puerile and absurd, as no one ever supposed that a transfer of Indian affairs to the War Department would entail the necessity for Army officers teaching Indian children their A B C's, any more than it is expected that the Commissioner and his agents will perform the same functions. But it is confidently believed that well educated Army officers could superintend the instruction of Indians both in schooling and agriculture as well as men whose efforts have been mainly directed to enriching themselves by defrauding the Indians.

No more conclusive proof of this could be adduced than that of the recent experiment with a number of the Kiowas and Comanches, who, as a punishment for pillaging and mudering the frontier settlers, were sent to Saint Augustine, Fla., in order to prevent their exercising a pernicious influence over the remainder of the tribes upon the reservation. These were probably the most savage, insubordinate, and troublesome Indians of the plains, yet they were placed under the charge of an Army officer, who at once inaugurated a system of rudimental instruction with them, which has been more successful than any efforts of the kind ever before attempted. Indeed, they have just been sent back to their people in quite an advanced state of civilization, and it is confidently expected that they will exercise a good influence upon others of their tribes.

The following is an exhibit of the appropriations for the Indian Department for the fiscal year ending June 30, 1876, as compared with those made for like purposes in 1848, just before the bureau was transferred to the Interior Department, viz:

Appropriations for 1875–'76.

For contingent expenses and for fulfilling treaty stipulations	$6,851,681 96
Pay of officers and clerks in the Commissioner's office	75,520 00
Pay of superintendents, inspectors, agents, and their clerks	136,000 00
Total appropriated in 1875–'76	7,063,201 96

Appropriations for 1847–'48.

For contingent expenses and for fulfilling treaty stipulations	$843,100 00
Pay of officers and clerks in Commissioner's office	18,700 00
Pay of superintendents, agents, and their clerks	12,678 00
Total appropriated in 1847–'48	874,478 00
Difference	6,188,723 96

The disbursement of the large appropriations that have been made for several years past, however carefully guarded by superior authority, must necessarily have furnished a prolific source for frauds when intrusted to dishonest men; and, as the Commissioner himself admits that his agents have shown themselves by no means above suspicion, may it not reasonably be conjectured that a large percentage of this money went into their pockets?

The evidence I have adduced seems, in my judgment, to render an admission of the following sequences logical and imperative, viz:

First. The conduct of Indian affairs under the existing system, after a practical working of twenty-nine years, has proved immensely expensive, highly conducive to fraud, and unsatisfactory to the Indians, provoking them to hostilities that have cost the lives of hundreds of border citizens as well as of many brave soldiers, whereas the management of this branch of the public service while controlled by the War Department was judicious, firm, and economical, and in every respect accorded with the Indian's sense of just and humane treatment.

2. If this compendium be correct, why not return to a system so conducive to peace, and so certain to avert the evils that will in the future, as they have in the past, inevitably follow the continuation of a faulty policy?

In conclusion, it is but an act of justice to remark that no one acquainted with the excellent character of the gentlemen composing the Indian Commission (who perform

their duties gratuitously) entertains a doubt that they have labored zealously in reforming abuses, and their efforts have unquestionably contributed largely to that end; but, as their visits to the agencies have necessarily been at wide intervals, it could not be expected that they would be able to exercise much control over the agents during their absence.

Should the transfer of the bureau be consummated, Army officers would gladly accept the aid of such men, and would not object to their supervising purchases and verifying accounts.

Respectfully submitted.

R. B. MARCY,
Inspector-General United States Army.

The ADJUTANT-GENERAL UNITED STATES ARMY.

Notes on the question of transferring the Indian Bureau to the War Department.

If it could be carried out, it would be wise policy to adopt a system looking to the ultimate investment of Indians with the rights of citizenship, and detaching them as individuals from all tribal connection, so far as their government is concerned. To this end regular steps would be necessary. Wild savages must first be restrained from acts of hostility and rapine. Then as many individuals as possible must be induced to engage in some pursuit for self-support, with the hope of owning and accumulating property, attaining all the rights of citizenship, and the certainty of protection in the enjoyment of these possessions. Then, means must be provided for giving the education necessary to a realization of the hope. Whole tribes could hardly be at once induced to enter upon a course of civilization, but many adult individuals possibly can be, and children could be, with more certainty, trained in this direction. But, not to break up family ties, and for the sake of example, the means of improvement should be afforded at such places as to be witnessed by all the members of the tribe, and within their reach, if they desire to use them.

The only possible hope of realizing such a scheme for the good of the Indian, even in the course of years, is in having its numerous details under one control, combining power to restrain with all the requisites for its accomplishment.

The care of Indians partakes of a military nature under any circumstances, except when they are so far civilized as to be capable of self-government, as are the Cherokees. It is notorious that Indians respect most the authority which immediately commands the soldiers. They even reverence the uniform, and in comparison despise the plain citizen's garb. They have generally greater confidence in Army officers than in most of their civilian agents.

It is seldom that agents and officers serving near them agree, and Indians are quick to discover their want of accord. Hence it occurs that the agencies are generally on separate parts of the reservations from the military posts which guard them. Were the commanding officers of the posts also the agents there would be no want of harmony, and there would be a saving in buildings and other expensive appliances.

If the Indian Bureau were under the War Department an officer could act as commissioner and manage it under the Secretary of War. Department commanders could act as superintendents, and officers with troops could act as agents, subagents, &c. Paymasters could pay annuities. Depot quartermasters and commissaries could purchase goods of all kinds and subsistence, and they could be transported and issued through the same departments. The accounts and returns for all these purchases and issues could be made on the same blanks, perhaps slightly altered, and the examination of them in the bureaus in Washington would involve but little more clerical labor. The medical officers with the troops could supply nearly, if not all, the aid required in that department.

It is apparent that, in general, a great saving and much more simple system can be thus obtained.

The inspection of Indian reservations and accounts could be regularly and efficiently made through the inspector's department.

The whole question of issues of arms and ammunition and of giving permits to trade with Indians being under one control, the mistakes now often made by which Indians become possessed of means to keep up hostilities with the troops would in great measure be corrected.

The transfer of Army supplies, of condemned clothing, of food, &c., for the use of Indians, sometimes necessary, could be much more easily arranged, and a great saving could be made by an intelligent use of condemned property for this purpose, which is now sold at auction to citizens, bringing but very small return to the government.

One object should always be kept in view, however, and that is that appropriations and expenditures for the Indian Department should be kept perfectly distinct from

those of the Army, that the military establishment may not be supposed to be more costly than it is.

Respectfully submitted.

E. D. TOWNSEND,
Adjutant-General.

ADJUTANT-GENERAL'S OFFICE,
May 15, 1875.

WAR DEPARTMENT,
Washington City, October 5, 1878.

SIR: I have the honor to transmit herewith, for the information of the joint committee on the transfer of the Indian Bureau, a letter from the Paymaster-General of the Army, dated the 23d ultimo, submitting an approximate estimate of the amount required for one year to pay the officers and troops stationed at the various Indian agencies at the several frontier forts and in the field against hostile Indians.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Indian Bureau Transfer.

WAR DEPARTMENT,
PAYMASTER-GENERAL'S OFFICE,
Washington, September 23, 1878.

SIR: In compliance with your indorsement on the letter of the chairman of the joint committee on Indian Bureau transfer, requesting "an estimate of the outlay of moneys for officers and troops stationed at the various Indian agencies at the several frontier forts and in the field against hostile Indians," I have the honor to submit the following as an estimate of the amount required for one year to pay the officers and troops stationed as above.

This estimate is based upon the reports of the commanding generals of the Military Division of the Pacific and of the Departments of the Missouri, Platte, and Dakota, forwarded by you to this office. It is an approximate estimate, the only one possible that can be furnished on the data supplied.

Division or department.	Troops stationed at or near agencies.			Troops in the field against hostile Indians.		
	Number of officers.	Number of men.	Amount.	Number of officers.	Number of men.	Amount.
Pacific	75	1,188	$361,307	177	2,726	$837,782
Missouri	91	1,028	359,005	103	1,440	459,430
Platte	23	351	148,252	143	2,144	815,465
Dakota	82	1,196	376,382	.....	.....	.....
Total	271	3,763	1,244,946	423	6,310	2,112,677

Very respectfully, your obedient servant,

BENJ. ALVORD,
Paymaster-General United States Army.

The ADJUTANT GENERAL OF THE ARMY.

A true copy.

BENJ. ALVORD,
Paymaster-General United States Army.

WAR DEPARTMENT,
Washington City, October 21, 1878.

SIR: In reply to your letter of June 22, 1878, requesting full data relative to the United States troops operating against hostile Indians, with estimated cost of such service for the fiscal year ending June 30, 1878, I have the honor to transmit herewith

the report of the Surgeon-General, dated the 12th instant, of the approximate estimated cost to the Medical Department on account of such service.

Very respectfully, your obedient servant,

G. W. McCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Indian Bureau Transfer.

WAR DEPARTMENT,
SURGEON-GENERAL'S OFFICE, PROPERTY DIVISION,
Washington, D. C., October 12, 1878.

GENERAL: I have the honor to acknowledge the receipt of a copy of a communication to the honorable the Secretary of War of June 22, 1878, from the chairman of the joint committee on transfer of Indian Bureau to War Department, requesting full data relative to United States troops operating against hostile Indians, with estimated cost of such service for the fiscal year ending June 30, 1878, referred to this office for report July 3, 1878, also copies of other papers pertaining thereto.

In reply, I have the honor to submit the following statement of the approximate estimated cost to the Medical Department on account of such service:

Department of the Missouri	$15,474 31
Department of Dakota	14,468 87
Department of the Platte	17,417 94
Department of Arizona	7,477 38
Department of California	10,235 52
Department of the Columbia	11,320 40
Total	76,394 42

The above estimate includes only the proportionate cost of medical and hospital supplies issued to the troops employed on such service based upon the reports of the commanding officers of the departments named above, and the expenses incurred for medical attendance and medicines to detachments of troops not provided with commissioned medical officers or contract surgeons.

To make a report in detail of the actual cost of the supplies used and expended for the use of the troops in these departments would occupy the time of the entire force of the division of this office, which has charge of the returns of medical and hospital property, for from four to six months, and even if such statistics of the actual cost were prepared, the results would probably not differ materially from the above estimate.

I am, general, very respectfully, your obedient servant,

J. K. BARNES,
Surgeon-General, U. S. A.

The ADJUTANT-GENERAL, U. S. A.

Official copy.

J. S. BILLINGS,
Surgeon and Acting Chief Medical Purveyor, U. S. A.

WAR DEPARTMENT,
Washington City, October 10, 1878.

SIR: Referring to my letter of the 25th ultimo, transmitting a report of the Quartermaster-General on the cost of transporting troops and supplies to Indian agencies by the War Department, I have the honor to transmit a supplemental report from the Quartermaster-General, dated the 7th instant, inclosing copies of statements prepared by the chief quartermasters of the Departments of the Missouri, of the Platte, and of Dakota, giving the cost of transportation to military posts in those departments.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Indian Bureau Transfer.

QUARTERMASTER-GENERAL'S OFFICE,
Washington, D. C., October 7, 1878.

SIR: With reference to the communication of the chairman of joint congressional committee on transfer of Indian Bureau dated June 22, 1878, calling upon the Secretary of War for the statement of the cost of transporting supplies to the various Indian agencies under the War Department, and to the report of this office thereon, dated September 16, 1878, I have now the honor to forward copies of statements pre-

pared by the chief quartermasters of the Departments of the Missouri, of the Platte, and of Dakota, giving the cost of transportation to military posts in those departments.

In the preparation of these statements the officers named labored under the difficulties set forth in the report of this office, growing out of the fact that actually the War Department does not transport any stores for Indians to any of the Indian agencies, and the quantity and quality of such transportation for any given time are not known, but the cost per 100 lbs. and per man of transportation to such agencies as are guarded by troops or are contiguous to military posts is embraced in these reports.

I respectfully recommend that these papers be forwarded to the committee for its information.

Very respectfully, your obedient servant,

M. C. MEIGS,
Quartermaster-General, Brevet Major-General, U. S. A.

The Hon. the SECRETARY OF WAR.

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
OFFICE CHIEF QUARTERMASTER,
Chicago, Ill., September 30, 1878.

GENERAL: In compliance with your instructions of the 9th ultimo, I have the honor to inclose herewith statements received from the Departments of the Missouri, the Platte, and Dakota, giving the cost of transporting supplies, &c., to the various Indian agencies under the War Department *in* those departments.

There are no Indian agencies in the Department of Texas.

These statements give the cost per 100 pounds. I endeavored to ascertain the total cost of transporting *all* supplies during a given period—say a year—but for the want of data it cannot be given. The report for the Department of the Platte, however, gives the approximate total cost of transporting freight to the *posts* for both troops and Indians.

I trust these reports will be found satisfactory.

Very respectfully, your obedient servant,

RUFUS INGALLS,
Colonel and Assistant Quartermaster-General,
Brevet Major-General, U. S. A., Chief Quartermaster.

The QUARTERMASTER-GENERAL, U. S. A.,
Washington, D. C.

A true copy.

HENRY HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF QUARTERMASTER,
Fort Leavenworth, Kans., August 28, 1878.

SIR: In compliance with instructions contained in your indorsement of the 12th instant, I have the honor to submit the following report:

1st. The cost, in cents per one hundred pounds, of transporting supplies for Indians from Fort Leavenworth, Kans., to each of the Indian agencies in the Department of the Missouri.

Agencies.	Full rate.	Land-grant (deducted).	Net rate.
To the Kansas agency, Kansas.			
Via Kansas Pacific Railway to Rossville ..... NOTE.—No payments are made to the Kansas Pacific Railway by the Quartermaster's Department.	38	38	0
To the White River agency, Colorado.			
Via Kansas Pacific Railway to Denver, Colo., and Colorado Central Railroad to Central City, Colo.; thence by wagon to agency ..... NOTE.—The deduction is for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department.	376	187	189

Agencies.	Full rate.	Land-grant (deducted).	Net rate.
To the Mescalero agency, New Mexico.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railroad to Pueblo, Colo., and Denver and Rio Grande Railway to El Moro, Colo.; thence by wagon to agency	537	127	410
NOTE.—The deduction is for the land-grant portion of the Atchison, Topeka and Santa Fé Railway from Atchison, Kans., to Sargent, Kans.			
To the Los Pinos agency, New Mexico.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railroad to Pueblo, Colo., and Denver and Rio Grande Railway to Alamosa, Colo.; thence by wagon to agency	357	122	235
NOTE.—The deduction is for the land-grant portion of the Atchison, Topeka and Santa Fé Railroad from Atchison, Kans., to Sargent, Kans.			
To the Abiquiu agency, New Mexico.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railroad to Pueblo, Colo., and Denver and Rio Grande Railway to Alamosa, Colo.; thence by wagon to agency	402	122	280
NOTE.—The deduction is for the land-grant portion of the Atchison, Topeka and Santa Fé Railroad from Atchison, Kans., to Sargent, Kans.			
To the Navajo agency, New Mexico.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railroad to Pueblo, Colo., and Denver and Rio Grande Railway to Alamosa, Colo.; thence by wagon to agency	588	122	466
NOTE.—The deduction is for the land-grant portion of the Atchison, Topeka and Santa Fé Railroad from Atchison, Kans., to Sargent, Kans.			
To the Pueblo agency, New Mexico.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railroad to Pueblo, Colo., and Denver and Rio Grande Railway to Alamosa, Colo.; thence by wagon to agency	588	122	466
NOTE.—The deduction is for the land-grant portion of the Atchison, Topeka and Santa Fé Railroad from Atchison, Kans., to Sargent, Kans.			
To the Quapaw agency, Indian Territory.			
Via Missouri Pacific Railway to Kansas City, Mo., and Missouri River, Fort Scott and Gulf Railroad to Baxter Springs, Kans, the point where Indians get their supplies	75	65	10
NOTE.—The deduction is for transportation over the Missouri River, Fort Scott and Gulf Railroad, all land-grant.			
To the Osage agency, Indian Territory.			
Via Kansas Pacific Railway to Lawrence, Kans., and Leavenworth, Lawrence and Galveston Railroad to Coffeyville, Kans.; thence by wagon to agency	140	65	75
NOTE.—The deduction is 22 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 43 cents for Leavenworth, Lawrence and Galveston Railroad, all land-grant.			
To the Pawnee agency, Indian Territory.			
Via Kansas Pacific Railway to Lawrence, Kans., and Leavenworth, Lawrence and Galveston Railroad to Coffeyville, Kans.; thence by wagon to agency	165	65	100
NOTE.—The deduction is 22 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 43 cents for Leavenworth, Lawrence and Galveston Railroad, all land-grant.			
To the Sac and Fox agency, Indian Territory.			
Via Kansas Pacific Railway to Junction City, Kans., and Missouri, Kansas and Texas Railway to Muskogee, Ind. T., thence by wagon to agency	247	122	125
NOTE.—The deduction is 45 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 77 cents for land-grant portion of Missouri, Kansas and Texas Railway, from Junction City to south line of Kansas.			
To the Union agency, Indian Territory.			
Via Kansas Pacific Railway to Junction City, Kans., and Missouri, Kansas and Texas Railway to Muskogee, Ind. T.; thence by wagon to agency	210	122	88
NOTE.—The deduction is 45 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 77 cents for land-grant portion of Missouri, Kansas and Texas Railway, from Junction City to south line of Kansas.			

Agencies.	Full rate.	Land-grant (deducted).	Net rate.
To the Cheyenne and Arapahoe agency, Indian Territory.			
Via Missouri Pacific Railway to Atchison, Kans., Atchison, Topeka and Santa Fé Railway to Wichita, Kans.; thence by wagon to agency	315	80	235
NOTE.—The deduction is for transportation over land-grant portion of the Atchison, Topeka and Santa Fé Railroad, from Atchison to Newton, Kans.			
To the Wichita agency, Indian Territory.			
Via Kansas Pacific Railway to Junction City, Kans., and Missouri, Kansas and Texas Railway to Caddo, Ind. T.; thence by wagon to agency	476	125	351
NOTE.—The deduction is 45 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 80 cents for land-grant portion of Missouri, Kansas and Texas Railway, from Junction City to south line of Kansas.			
To the Kiowa and Comanche agency, Indian Territory.			
Via Kansas Pacific Railway to Junction City, Kans., and Missouri, Kansas and Texas Railway to Caddo, Ind. T.; thence by wagon to agency	435	125	310
NOTE.—The deduction is 45 cents for Kansas Pacific Railway, to which no payments are made by Quartermaster's Department, and 80 cents for land-grant portion of Missouri, Kansas and Texas Railway, from Junction City to south line of Kansas.			

2d. Cost per man of transportation of troops in connection with above report.

From Fort Leavenworth—

To Rossville (*en route* to Kansas Agency)	$3 65
To Central City (*en route* to White River Agency)	39 25
To Alamosa *en route* to Los Pinos, Abiquiu, Navajo, and Pueblo agencies)	25 23
To El Moro (*en route* to Mescalero Agency)	22 23
To Baxter Springs (*en route* to Quapaw Agency)	1 05
To Coffeyville (*en route* to Osage and Pawnee Agencies)	Nothing.
To Muscogee (*en route* to Sac and Fox and Union Agencies)	7 68
To Wichita *en route* to Cheyenne and Arapahoe Agency)	5 74
To Caddo (*en route* to Wichita and Kiowa and Comanche agencies)	13 81

From the above all land-grant proportions have been deducted.

From the points named to the various agencies it is presumed that troops would march, therefore no rate is given from the railroad points to agencies. In some few cases there is stage transportation available.

Very respectfully, your obedient servant,

R. SAXTON,
Deputy Quartermaster-General, Chief Quartermaster.

The CHIEF QUARTERMASTER
Military Division of the Missouri, Chicago, Ill.

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF QUARTERMASTER,
Fort Leavenworth, Kans., September 16, 1878.

SIR: I have the honor to state, in reply to your letter of the 10th instant, that there is no information at hand showing the quantity of stores to be transported in any one year to each of the Indian agencies in this department. If such information can

be furnished, the report can be at once made up here, or can be readily calculated from the report already forwarded to you.

Very respectfully,

R. SAXTON,
Chief Quartermaster.

CHIEF QUARTERMASTER,
Military Division of the Missouri, Chicago, Ill.

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

HEADQUARTERS DEPARTMENT OF THE PLATTE,
CHIEF QUARTERMASTER'S OFFICE,
Omaha Barracks, Nebraska, September 14, 1878.

SIR: I have the honor to acknowledge the receipt of your communication of August 12, 1878, and to forward herewith statements showing the cost of transporting one hundred pounds freight, and one man, from Omaha to each station in this command.

These statements include approximately the total cost of transporting troops and freight during the last fiscal year to the four posts at or near which there were Indian agencies.

Very respectfully, your obedient servant,

M. I. LUDINGTON,
Chief Quartermaster.

CHIEF QUARTERMASTER,
Military Division of the Missouri, Chicago, Ill.

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

Statement of cost of transporting passengers under the War Department from Omaha, Nebr., to the various military stations in the Department of the Platte, at rates of July, 1878.

Omaha to—	Rail.	Stage.	Total.	Approximate cost of transporting passengers during fiscal year 1877-'78.
Fort Hartsuff	7.70	5.00	12.70	.....
Fort McPherson	13.85	.....	13.85	.....
Sidney Barracks	22.15	.....	22.15	.....
Cheyenne Depot and Fort Russell	31.15	.....	31.15	.....
Fort Sanders	35.90	.....	35.90	.....
Fort Steele	46.75	.....	46.75	.....
Fort Hall	85.00	6.50	91.50	$4,750 00
Camp Douglas	79.50	.....	79.50	.....
Fort Cameron	83.50	18.00	101.50	.....
Camp Robinson	22.15	15.00	37.15	1,260 00
Camp Sheridan	22.15	20.00	42.15	20 00
Fort Laramie	31.15	8.00	39.15	.....
Fort Fetterman	40.75	10.00	50.75	.....
Fort McKinney	40.75	20.00	60.75	.....
Camp Brown	62.00	27.00	89.00	1,350 00

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

Statement of cost of transporting supplies under the War Department from Omaha, Nebr., to the various military stations in the Department of the Platte, at rates of July, 1878.

Omaha to—	Class.						Approximate distance in miles.	Average cost per 100 pounds per 100 miles.	Approximate cost of transporting freight during fiscal year 1877-'78.
	1st.	2d.	3d.	4th.	S. p.	Average.			
Fort Cameron:									
Rail	$3 65	$3 05	$2 00	$1 50	$1 07½	$2 26	1,142	.....	.....
Wagon	1 73	1 73	1 73	1 73	1 73	1 73	146	.....	.....
Total	5 38	4 78	3 73	3 23	2 80½	3 99	1,288	$0 31	.....
Camp Sheridan (late Spotted Tail agency):									
Rail	1 55	1 35	1 12	.....	52½	1 14	414	.....	.....
Wagon	1 65	1 65	1 65	.....	1 65	1 65	162	.....	.....
Total	3 20	3 00	2 77	.....	2 17½	2 79	576	48	$13,363 55
Camp Robinson (late Red Cloud agency):									
Rail	1 55	1 35	1 12	.....	52½	1 14	414	.....	.....
Wagon	1 30	1 30	1 30	.....	1 30	1 30	120	.....	.....
Total	2 85	2 65	2 42	.....	1 82½	2 44	534	46	27,440 50
Fort Laramie:									
Rail	1 92	1 61	1 31	.....	62½	1 37	518	.....	.....
Wagon	1 00	1 00	1 00	.....	1 00	1 00	86	.....	.....
Total	2 92	2 61	2 31	.....	1 62½	2 37	604	39	.....
Fort Fetterman:									
Rail	2 22	1 90	1 56	.....	62½	1 58	625	.....	.....
Wagon	87	87	87	.....	87	87	83	.....	.....
Total	3 09	2 77	2 43	.....	1 49½	2 45	708	35	.....
Fort McKinney:									
Rail	2 22	1 90	1 56	.....	62½	1 58	625	.....	.....
Wagon	1 65	1 65	1 65	.....	1 65	1 65	177	.....	.....
Total	3 87	3 55	3 21	.....	2 27½	3 23	799	40	.....
Camp Brown (near Indian agency):									
Rail	3 00	2 58	2 15	.....	75	2 12	859	.....	.....
Wagon	1 35	1 35	1 35	.....	1 35	1 35	147	.....	.....
Total	4 35	3 93	3 50	.....	2 10	3 47	1,006	35	42,503 60
Fort Hartsuff:									
Rail	62	54	46	.....	50	53	153	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	75	.....	.....
Total	62	54	46	.....	50	53	228	23	.....
Fort McPherson:									
Rail	1 08	90	76	.....	50	78	278	.....	.....
Wagon	18	18	18	.....	18	18	7	.....	.....
Total	1 26	1 08	94	.....	68	96	285	34	.....
Sidney Barracks:									
Rail	1 55	1 35	1 12	.....	52½	1 14	414	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	1 55	1 35	1 12	.....	52½	1 14	414	28	.....
Fort Russell and Cheyenne Depot:									
Rail	1 92	1 61	1 31	.....	62½	1 37	518	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	1 92	1 61	1 31	.....	62½	1 37	518	27	.....

Statement of cost of transporting supplies under the War Department, &c.—Continued.

Omaha to—	Class.						Approximate distance in miles.	Average cost per 100 pounds per 100 miles.	Approximate cost of transporting freight during fiscal year 1877-'78.
	1st.	2d.	3d.	4th.	S. p.	Average.			
Fort Sanders:									
Rail	$2 08	$1 77	$1 43	.....	$0 62½	$1 48	570	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2 08	1 77	1 43	.....	62½	1 48	570	$0 26	.....
Fort Steele:									
Rail	2 43	2 08	1 74	.....	70	1 74	694	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2 43	2 08	1 74	.....	70	1 74	694	25	.....
Fort Hall (near Indian agency):									
Rail	3 10	2 60	2 10	$1 60	85	2 05	1,055	.....	.....
Wagon	1 35	1 35	1 35	1 35	1 35	1 35	135	.....	.....
Total	4 45	3 95	3 45	2 95	2 20	3 40	1,190	29	$12,810 64
Camp Douglas:									
Rail	3 30	2 75	2 00	1 50	87½	2 09	1,067	.....	.....
Wagon	.....	.....	.....	.....	.....	.....	2	.....	.....
Total	3 30	2 75	2 00	1 50	87½	2 09	1,069	20	.....

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

QUARTERMASTER-GENERAL'S OFFICE,
October 7, 1878.

HEADQUARTERS DEPARTMENT OF DAKOTA,
OFFICE CHIEF QUARTERMASTER,
Saint Paul, Minn., September 2, 1878.

SIR: In obedience to the instructions contained in your two indorsements, dated respectively August 12 and 21, 1878, on copy of communication of the Hon. Alvin Sanders, chairman Joint Committee on Indian Bureau Transfer, I have the honor to submit the following statement of the cost of transporting supplies to the several Indian agencies in the Department of Dakota, taking Chicago as the initial point of shipment, as suggested by you, in the absence of positive data in that regard.

Chicago to Sioux City, averaged 19 cents per 100 pounds on all stores.

Sioux City to Yankton, averaged 10 cents per 100 pounds for stores to Standing Rock and below.

Sioux City to Yankton, averaged 5 cents per 100 pounds for stores to points above Standing Rock.

Rates on the Missouri River, as follows:

	Cents.	
Less than 50 miles	45	Per 100 pounds per 100 miles.
50 miles or less than 100	25	
100 miles or less than 200	12	
200 miles or less than 300	16	
300 miles or less than 500	14	
500 miles or less than 800	11	
800 miles or over	9	

Rates by wagon in Montana, $1.14½ per 100 pounds per 100 miles.

Rates by wagon in Dakota, $1.21 per 100 pounds per 100 miles.

	Per 100 pounds.
From Chicago via Sioux City and Yankton:	
To Spotted Tail Agency, Dakota	$0 44½
To Yankton Agency, Dakota	54
To Lower Brulé Agency, Dakota	64½
To Crow Creek Agency, Dakota	66½
To New Red Cloud Agency, Dakota	70½
To Cheyenne Agency, Dakota	81
To Standing Rock Agency, Dakota	87½
To Fort Berthold Agency, Dakota	1 03½
To Fort Peck Agency, Montana	1 23
To Crow Agency, Montana	4 00
From Chicago via Saint Paul:	
From Chicago to Sisseton Agency	2 28½
From Chicago via Saint Paul to Fort Totten	1 91½

Very respectfully, your obedient servant,

CHS. H. TOMPKINS,
Deputy Quartermaster-General, U. S. A., Chief Quartermaster.

The CHIEF QUARTERMASTER,
Military Division of the Missouri, Chicago, Ill.

Official copy.

RUFUS INGALLS,
Colonel and Assistant Quartermaster-General, Brevet Major-General U. S. A.

QUARTERMASTER-GENERAL'S OFFICE, *October* 7, 1878.

A true copy.

HENRY C. HODGES,
Deputy Quartermaster-General U. S. A.

WAR DEPARTMENT,
Washington City, October 28, 1878.

SIR: I have the honor to transmit herewith, for the information of the joint committee on the Indian Bureau transfer, the report of the Quartermaster-General, dated the 14th instant, of the estimated cost to the Quartermaster's Department for one year of maintaining troops at the various Indian agencies in the Military Division of the Missouri, and in the field operating against hostile Indians; also the estimated cost of maintaining on the same basis as troops the Indians at the various Indian agencies in the Military Division of the Missouri.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, *United States Senate,*
Chairman Joint Committee on Indian Bureau Transfer.

WAR DEPARTMENT,
QUARTERMASTER-GENERAL'S OFFICE,
Washington, D. C., October 14, 1878.

GENERAL: In accordance with the indorsement of your office of July 3, 1878, referring copy of the request of the joint Congressional committee on the transfer of the Indian Bureau to the War Department, dated June 22, 1878, for certain information, including an estimate of the outlays of moneys in maintaining the troops at the various Indian agencies, and also estimate of the expense of conducting the Indian Bureau under the direction of the War Department, I have the honor to report as follows:

1st. The estimated cost to the Quartermaster's Department for one year of maintaining the troops at the various Indian agencies in the Military Division of the Missouri, and in the field operating against hostile Indians, is, according to reports received at this office, and estimates of the cost of clothing prepared at this office for the troops engaged in the service referred to in the Departments of the Missouri and Platte, as follows:

Department of the Missouri.

Regular supplies	$431,521 05
Incidental expenses	57,796 28
Barracks and quarters and hospitals	27,449 40
Army transportation, exclusive of freight	153,485 48
Clothing	108,742 77
Total	778,994 98

Department of Dakota.

Regular supplies	$58,473 73
Incidental expenses	12,000 00
Barracks and quarters	64,918 32
Clothing	50,543 96
Total	185,936 01

Department of the Platte.

Regular supplies	$627,352 00
Barracks and quarters	28,000 00
Army transportation	461,175 00
Clothing	122,743 31
Miscellaneous	185,574 00
Total	1,424,844 31

Recapitulation.

Department of the Missouri	$778,994 98
Department of Dakota	185,936 01
Department of the Platte	1,424,844 31
Total	2,389,775 30

On the subject of transportation special reports were made by this office to the honorable the Secretary of War, September 16 and October 7, 1878.

2d. The estimated cost to the Quartermaster's Department of maintaining, on the same basis as troops, the Indians at the various Indian agencies in the Military Division of the Missouri, should the Indian Bureau come under the direction of the War Department, for one year is, according to the reports received at this office, as follows

Department of the Missouri.

Regular supplies	$927,325 00
Incidental expenses	17,700 00
Clothing	4,325,836 00
Total	5,270,861 00

In reference to this estimate, Lieut. Col. R. Saxton, deputy quartermaster-general, U. S. A., chief quartermaster Department of the Missouri, by whom prepared, under date of August 27, 1878, in submitting it, remarks as follows:

"The estimate is compiled from the best information at present obtainable. It is proper to remark in its connection that, although the estimate is made as ordered, on the basis of troops, it is, undoubtedly, largely in excess of the amount which would actually be required for maintaining Indians. It is not thought that the cost of clothing necessary to be furnished the Indians would be much more than one-tenth of the amount named in the estimate. As fuel and straw will be provided by the Indians themselves, the cost to the government for those articles should be nothing."

In this view, Colonel R. Ingalls, assitant quartermaster-general, U. S. A., chief quartermaster Military Division of the Missouri, concurs. This would reduce the estimate to about $450,283.60.

Colonel Saxton further remarks as follows in reference to the estimate:

"I have no data upon which to base an estimate of the cost of sheltering the Indians. I presume they are already sheltered in some manner. The cost, yearly, of keeping their shelter in repair could only be ascertained by personal inspection. I make no estimate for cost of Indian agents, for the reason that it is presumed that, if the bureau is transferred to the War Department, an officer of the Army will be detailed at each agency. At least one interpreter would be required at each agency. At some agencies probably several might be required. * * * I think competent interpreters can be secured at an average of $900 per annum, and I have made that rate the basis of my estimate. Some additional clerical force would be necessary in my office, and I have included pay of two clerks, at $1,200 each per year. Possibly a slight increase of employés by transporting quartermasters would be necessary, but the number thereof could only be determined by actual experience. I have no data upon which to base an estimate for any other employés at agencies, but the cost of such as are requisite would certainly not exceed that at present paid by the Indian Bureau."

Colonel Ingalls concurs with Colonel Saxton as to the probable cost of shelter, &c.

Department of Dakota.

Regular supplies	$246,528 73
Incidental expenses	12,000 00
Barracks and quarters	764,315 50
Clothing	986,184 75
Total	2,009,528 98

It is suggested, with reference to this estimate, that perhaps the same remarks as were made by Colonel Saxton, and concurred in by Colonel Ingalls, as to the estimated cost for fuel and straw, shelter and clothing for the Indians in the Department of the Missouri, will apply in the case of the Indians in the Department of Dakota, which would materially reduce this estimate.

Department of the Platte.

Regular supplies	$82,438 79
Incidental expenses	5,760 00
Clothing	327,616 91
Total	415,815 70

Colonel Ingalls, in whose office this estimate was prepared, in letter of the 3d instant, forwarding it to this office, remarks as follows as to the cost of sheltering the Indians:

"I am unable to give the probable cost of sheltering the Indians. They are probably already provided with shelter, and the expense of maintaining it can only be determined by inspection at each place. The amount cannot be large, however."

It may be proper to state here that the number of Indians in the several departments mentioned, according to the reports received at this office, and on which the estimates are based, is as follows:

Department of the Missouri	102,558
Department of Dakota	23,475
Department of the Platte	7,916
Total	133,949

There are no Indian agencies in the Department of Texas. A similar report will be made by this office as to the Division of the Pacific (which will complete the report required of this office) after the receipt of reports from the chief quartermaster of that division, which have been called for.

Very respectfully, your obedient servant,

M. C. MEIGS,
Quartermaster-General, Bvt. Maj. Gen., U. S. A.

The ADJUTANT-GENERAL, U. S. A.,
Washington, D. C.

Official:

HENRY C. HODGES,
Deputy Quartermaster-General, U. S. A.

WAR DEPARTMENT,
Washington City, December 5, 1878.

SIR: In connection with previous reports on the subject, I have the honor to transmit herewith, for the information of the Joint Committee on the Transfer of the Indian Bureau to the War Department, the report of the Quartermaster-General, dated the 29th ultimo, of the cost to the Quartermaster Department for one year of maintaining troops in connection with Indian affairs in the Department of Arizona.

Very respectfully, your obedient servant,

G. W. McCRARY,
Secretary of War.

Hon. A. SAUNDERS, United States Senator,
Chairman of Committee on Transfer of the Indian Bureau.

WAR DEPARTMENT,
QUARTERMASTER-GENERAL'S OFFICE,
Washington, D. C., November 29, 1878.

GENERAL: In connection with the letter to you from this office, of October 14, 1878, reporting certain information called for by the Joint Congressional Committee on the Transfer of the Indian Bureau to the War Department, I now have the honor to communicate the following information on the subject from the Department of Arizona,

furnished by the chief quartermaster of that department, and forwarded to this office by the chief quartermaster Military Division of the Pacific:

1st. Estimated cost to the Quartermaster's Department for one year (1877–'78) of maintaining troops at the various Indian agencies and in the field operating against hostile Indians:

Regular supplies	$314,700
Incidental expenses	48,500
Cavalry and artillery horses	23,500
Barracks and quarters	33,500
Army transportation	118,500
Clothing and equipage	35,000
Hospitals	3,900
Total	577,600

Cost of transporting stores to department from without not included.

2d. Estimated cost to the Quartermaster's Department of maintaining, on the same basis as troops, the Indians at the various Indian agencies should the Indian Bureau come under the direction of the War Department:

Regular supplies	$28,000
Incidental expenses	22,000
Barracks and quarters	6,000
Army transportation	142,000
Clothing and equipage	40,000
Hospitals	2,500
Total	240,500

Including cost of transportation of supplies to agencies.

This report of the Department of Arizona has been held at this office since the 29th ultimo, awaiting the report as to remainder of the division, but the latter up to this date not being received, it has been deemed best to communicate this without further delay. The report as to remainder of the Division of the Pacific will, upon its receipt here, be promptly communicated. The chief quartermaster of the division has this day been directed by telegraph to forward the report with the least delay practicable.

In accordance with the request of the chairman of the committee, of June 22, 1878, I inclose herewith eight copies of this report.

Very respectfully, your obedient servant,

STEWART VAN VLIET,
Acting Quartermaster-General,
Bvt. Maj. Gen., U. S. A.

The ADJUTANT-GENERAL, U. S. A.,
Washington, D. C.

WAR DEPARTMENT, *Washington City, September* 25, 1878.

SIR: In reply to your letter of the 22d June last, requesting "a statement of the cost of transporting supplies, &c., to the various Indian agencies, either by railway, steamboat, wagon transportation, or otherwise, under the War Department; also the cost of transporting troops in the same connection," I have the honor to transmit herewith the report of the Quartermaster-General, dated the 16th instant, and the accompanying general orders and abstracts of transportation contracts.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Transfer of Indian Bureau.

WAR DEPARTMENT, QUARTERMASTER-GENERAL'S OFFICE,
Washington, D. C., September 16, 1878.

SIR: I have the honor to return herewith the communication of the chairman of the Joint Congressional Committee on Transfer of Indian Bureau, dated June 22, 1878, calling upon the Secretary of War for a statement of the cost of transporting supplies to the various Indian agencies, either by railway, steamboat, wagon transportation, or otherwise, under the War Department, also the cost of transporting troops in the same connection.

An effort involving considerable work and research has been made by this office to compile the information required. The effort has been unsuccessful; probably from the nature of the case it could not have been otherwise.

No supplies for Indians are transported to Indian agencies under the direction of the War Department; the quantity and quality of supplies needed annually, or for any specified period for each particular agency, cannot be accurately determined by the War Department, and on application for this information to the Interior Department the Secretary of War has been furnished with a copy of a letter from the Commissioner of Indian Affairs, stating that it cannot be given with the present clerical force of that office "except by neglecting more important business." Many of the agencies are remote from any military post or station. Those that may be considered near are often reached by other routes, and are generally so distant, through wild unsettled regions, as to preclude the formation of trustworthy estimates of the cost of transportation to such agencies on the basis o fthe cost to the nearest military posts, and, generally speaking, the depots of supply, distances through the wilderness, and rates of transportation would necessarily be merely conjectural, not precise and trustworthy, as they should be in view of the critical analysis of any estimates which should and probably would be made.

It is believed, however, that the committee can gather the information it practically requires on this subject from a statement of the prices paid by the War Department for the transportation of troops and supplies and an explanation of the methods which regulate the furnishing of transportation for the Army.

I inclose an abstract of the transportation contracts received at this office during the fiscal year ending June 30, 1878, showing names of contractors, routes of supply, rates per 100 pounds per 100 miles (or for entire distance), and dates of commencement and expiration of each contract.

With reference to this abstract, it is observed that owing to the failure of the Forty-fourth Congress to make any appropriation for the support of the Army for the fiscal year ending June 30, 1878, and the fact that no money was available to meet expenditures incurred during that year until November 21, 1877, the War Department was compelled to resort to expedients for providing transportation for the Army on a credit basis, with no absolute promise of payment for service, and to enter into contracts of only six months' duration. The additional expense thus incurred is estimated to have been fully 5 per cent. over what would have been the cost if funds had been available from the beginning of the fiscal year, July 1, 1877.

Proposals for transportation contracts are invited by public advertisement, and each contract is awarded to the lowest responsible bidder who can furnish satisfactory security that the service will be faithfully performed. These contracts are generally made for a period of one year, beginning and ending with the concluding fiscal year, and in no case exceed twelve months in duration.

As a rule, no contracts are made by the Quartermaster's Department for any specified time for rail transportation; in this respect the practice differs from that of the Indian Bureau, which, it is understood, makes contracts by the season with railroad and transportation companies, or intermediates, for transportation from New York, Philadelphia, Chicago, and other purchasing depots through to Indian agencies.

It has been considered by the War Department that the adoption of such a method of forwarding troops and supplies would result in complications and difficulties and violations of law. It would tie up the department to one rate or route in a fluctuating market; it would place the transportation of troops and stores required to pass over many railroads in the hands of a single contractor, probably an intermediate, drawing a commission from the railroads, the department thus sacrificing the advantages of direct dealings with those who perform the service; it would involve the department in contracts providing for the payment of money, proportions of which would, in all probability, be paid into the hands of land-grant railroads on the route, in violation of the laws of Congress prohibiting any payments to any railroads for the transportation of United States supplies over a land-grant road. Therefore, officers who make shipments from eastern and interior railroad points are directed to take advantage of the best rates attainable at times of shipment, to deal directly with railroad companies, and not to confine themselves to any one route or a fixed rate, and yearly contracts are limited generally to transportation by wagon and boat from and to the several railroad termini or stations on the frontier which are the most advantageous starting points for routes of military supply by road and water.

The general depots of the Quartermaster's Department are at Philadelphia, Pa.; New York City; Jeffersonville, Ind.; and Washington, D. C., where a stock is kept of the various quartermaster supplies, &c., needed for the Army; there are also subdepots at San Francisco, Cal.; Omaha, Nebr.; Saint Paul, Minn.; Fort Leavenworth, Kans.; San Antonio, Tex.; New Orleans, La.; Cheyenne, Wyo., and Chicago, Ill.

The system of transportation and the regulations regarding it are explained more in detail in the accompanying General Orders from the War Department.

Very respectfully, your obedient servant,

M. C. MEIGS,

Quartermaster-General, Brevet Major-General, U. S. A.

The Hon. the SECRETARY OF WAR.

Abstract of contracts for water-transportation entered into by the Quartermaster's Department, received at the Quartermaster-General's Office during the fiscal year ending June 30, 1878.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rates.								Date of expiration of contract.
				Rates for, &c.	Distances.							
					Less than 50 miles.	50 or more and less than 100 miles.	100 or more and less than 200 miles.	200 or more and less than 300 miles.	300 or more and less than 500 miles.	500 or more and less than 800 miles.	800 miles and more.	
Lieut. Col. C. H. Tompkins, deputy quartermaster-general.	Sanford B. Coulson.	1878. Mar. 12	From Yankton, Dak., to Ft. Benton, Mont., and intermediate points and return, on the Missouri River.	Officers, each, per mile	$0 03	$0 03	$0 03	$0 03	$0 03	$0 03	$0 03	1878. Oct. 31
				Enlisted men, laundress, and authorized employés, each, per mile	2½	2½	2½	2½	2½	2½	2½	
				Horses, mules, or cattle, each, per mile	4	4	4	4	4	4	4	
				Military stores and supplies, per 100 lbs. per 100 miles	45	25	12	16	14	11	9	
Do	W. J. Kountz	Mar. 12	From Ft. Buford, Dak., to Bighorn Depot and intermediate points on the Yellowstone River.	ARTICLE XII. For and in consideration of the faithful performance of the stipulations of this agreement the said W. J. Kountz shall be paid, at the office of the quartermaster's department at Saint Paul, Minn., or other designated points, in the legal currency of the United States at the following rates: For the transportation of each officer, five (5) cents per mile; for the transportation of each enlisted man, laundress, or authorized employé, three (3) cents per mile; for the transportation of each head of horses, mules, or cattle, six (6) cents per mile; for the transportation of military stores or supplies, twenty-nine (29) cents per one hundred pounds per one hundred miles; said transportation to be paid in all cases according to the distance from place of departure to that of delivery; provided that the table of distances compiled under the direction of the chief quartermaster Military Department of Dakota (dated December 7, 1877) shall govern as to distances between points fixed in said table.								Aug. 15
Do	Edward Fenlon	Mar. 12	From Bighorn Depot to mouth of Little Bighorn River and intermediate points on the Bighorn River, by steamboat or wagon.	ARTICLE XII. For and in consideration of the faithful performance of the stipulations of this agreement, the said Edward Fenlon shall be paid, at the office of the quartermaster's department at Saint Paul, Minn., or other designated points, in the legal currency of the United States, at the following rates: For the transportation of each officer, nine (9) cents per mile; for the transportation of each enlisted man, laundress, or authorized employé, six (6) cents per mile; for the transportation of each head of horses, mules, or cattle, four (4) cents per mile; for the transportation of military stores or supplies by water, sixty-four (64) cents per one hundred pounds per one hundred miles; said transportation to be paid in all cases according to the distance from place of departure to that of delivery; provided that the table of distances compiled under the direction of the chief quartermaster Military Department of Dakota (dated December 7, 1877) shall govern as to distances between points fixed in said table.								1879. Mar. 31

Abstract of contracts for water transportation entered into by the Quartermaster's Department, &c.—Continued.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rates.	Date of expiration of contract.
Lieut. Col. C. H. Tompkins, deputy quartermaster-general.	Norman W. Kittson	1878. Feb. 9	From Moorhead, Minn., or Fargo, Dak., to Ft. Pembina, Dak., on Red River of the North.	SIXTH. For and in consideration of the faithful performance of the stipulations of this agreement, the party of the second part shall be paid, at the office of the chief quartermaster Department of Dakota, at Saint Paul, Minn., eight dollars ($8) for each officer and six dollars ($6) for each enlisted man transported under this agreement, and one dollar ($1) per hundred pounds for the military supplies turned over to him for transportation between the fifteenth day of April and the thirty-first day of July, one thousand eight hundred and seventy-eight, and one dollar and thirty-five cents ($1.35) per hundred pounds for the military supplies turned over to him for transportation between the first day of August and the fifteenth day of October, one thousand eight hundred and seventy-eight, and transported under this agreement.	1878. Oct. 15
Lieut. Col. A. J. Perry, deputy quartermaster-general.	Charles H. Whitney & Co.	1878. July 28	From New Orleans, La., to Galveston, Indianola, and Brazos Santiago or return.		Dec. 31

From—	To Galveston or return.	To Indianola or return.	To Brazos Santiago or return.
Ordinary freights:			
New Orleans	$0 40	$0 50	$0 75
Galveston	.....	40	75
Indianola	.....	.....	75
Powder:			
New Orleans	1 20	1 50	2 25
Galveston	.....	1 20	2 25
Indianola	.....	.....	2 25
Horses, each:			
New Orleans	7 50	10 00	15 00
Galveston	.....	7 50	15 00
Indianola	.....	.....	15 00
Officers—cabin passage, without subsistence:			
New Orleans	10 00	15 00	30 00
Galveston	.....	7 00	30 00
Indianola	.....	.....	30 00
Enlisted men—deck passage, without subsistence:			
New Orleans	5 00	7 00	12 00
Galveston	.....	3 00	12 00
Indianola	.....	.....	12 00

Do	....do	Jan. 23	From New Orleans, La., to Galveston, Indianola, Brazos Santiago, and Houston or return.	From—	To Galveston or return	To Indianola or return.	To Brazos Santiago or return.	To Houston or return.	1878.
				Ordinary freights:					
				New Orleans or Morgan City	$0 30	$0 50	$0 75	$0 40	June 30
				Powder:					
				New Orleans or Morgan City	90	1 50	2 25	1 20	
				Horses, each:					
				New Orleans or Morgan City	7 50	10 00	15 00	10 00	
				Officers—cabin passage, without subsistence:					
				New Orleans or Morgan City	10 00	15 00	30 00	12 00	
				Enlisted men—deck passage, without subsistence:					
				New Orleans or Morgan City	5 00	7 00	12 00	6 00	
Lieut. Col. A. R. Eddy, deputy quartermaster-general.	L. A. Loomis	Apr. 3	From Astoria, Oreg., to Forts Stevens and Canby and return.	$450 per month; $6 per hour for detention, and $30 for each extra trip					June 30

QUARTERMASTER-GENERAL'S OFFICE, *September* 19, 1878.
Official:

J. D. BINGHAM,
Deputy Quartermaster-General, United States Army.

Abstracts of contracts for wagon-transportation entered into by the Quartermaster's Department, received at the office of the Quartermaster-General during the fiscal year ending June 30, 1878.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rates.	Date of expiration of contract.
Maj. B. C. Card, chief quartermaster, Department of Dakota, Saint Paul, Minn.	Edgar G. Maclay & Co	July 9, 1877	From Fort Benton, Mont., or any other point on the Missouri River, within the Territory of Montana, or at any other point within said Territory, or at Corinne or other station on the Union Pacific Railroad, to any point in said Territory, or at any point that is now or may be established in said Territory, and to posts on the Yellowstone and Bighorn Rivers.	$1.23 per 100 pounds per 100 miles	December 31, 1877.
Lieut. Col. A. R. Eddy, chief quartermaster, Department of the Columbia, Portland, Oreg.	Thomas G. Reames ..	Jan. 24, 1878	From Roseburg to Fort Klamath, Oreg., 200 miles.	4½ cents per pound for the whole distance, during the months of April, May, and June, 1878.	June 30, 1878.
Do.....	Louis Solomon	Jan. 24, 1877	.....do	$8\frac{7}{10}$ cents per pound for the whole distance, during the months of January, February, and March, 1878.	Do.
Do.....	S. Rhinehart	June 30, 1877	From Winnemucca, Nev., to Camp Harney Oreg., 252 miles.	4½ cents, coin, per pound for the whole distance ...	October 31, 1877.
Maj. J. J. Dana, quartermaster, Philadelphia, Pa.	William J. Crawford ..	Jan. 2, 1878	Hauling in the city of Philadelphia and vicinity.	Various	June 30, 1878.
Lieut. Col. Rufus Saxton, chief quartermaster, Department of the Missouri, Fort Leavenworth, Kans.	Edward Fenlon	Dec. 22, 1877	Route No. 1, Caddo to Fort Sill, Ind. Ter., 157 miles.	$2.20 per 100 pounds for the entire distance	Do.
Do.....	.....do	Dec. 22, 1877	Route No. 2, Wichita, Kans.. to Fort Reno, Ind. Ter., 164 miles.	.....do	Do.
Do.....	W. M. D. Lee	Dec. 22, 1877	Route No. 3, Dodge City, Kans., to Fort Elliott, Tex., 184 miles.	$2.40 per 100 pounds for the entire distance	Do.
Do.....	E. B. Allen	Dec. 31, 1877	Route No. 4, El Moro, Colo., to Fort Stanton, N. Mex., 328 miles.	$3.94 per 100 pounds for the entire distance	Do.
Do.....	F. F. Struby	Jan. 25, 1878	Route No. 5, Garland, Colo., to Santa Fé, N. Mex., 143 miles.	$2 for mule or horse transportation, from February 1, 1878, to March 31, 1878, inclusive, and $1.25 for ox transportation, from April 1, 1878, to June 30, 1878, inclusive, per 100 pounds for the whole distance.	Do.

Do	F. F. Struby	Jan. 25, 1878	Route No. 6, Garland, Colo., to Fort Craig, N. Mex, 303 miles.	$4 for mule or horse transportation from February 1, 1878, to March 31, 1878, inclusive, and $2.50 for ox transportation from April 1, 1878, to June 30, 1878, inclusive, per 100 pounds for the whole distance.	Do.
Do	do	Jan. 25, 1878	Route No. 7, Garland, Colo., to Fort Wingate, N. Mex., 313 miles.	$4.50 for mule or horse transportation from February 1, 1878, to March 31, 1878, inclusive, and $2.75 for ox transportation from April 1, 1878, to June 30, 1878, inclusive, per 100 pounds for the whole distance.	Do.
Do	do	Jan. 25, 1878	Route No. 8, Garland, Colo., to Fort Selden, N. Mex., 388 miles.	$4.50 for mule or horse transportation from February 1, 1878, to March 31, 1878, and $3.25 for ox transportation from April 1, 1878, to June 30, 1878, per 100 pounds for the whole distance.	Do.
Do	do	Jan. 25, 1878	Route No. 9, Garland, Colo., to Fort Bayard, N. Mex., 481 miles.	$5.50 for mule or horse transportation from February 1, 1878, to March 31, 1878, and $4 for ox transportation from April 1, 1878, to June 30, 1878, per 100 pounds for the whole distance.	Do.
Do	do	June 25, 1878	Route No. 10, Garland, Colo., to Camp Apache, Ariz., 456 miles.	$6 for mule or horse transportation, from February 1, 1878, to March 31, 1878, and $4.25 for ox transportation from April 1, 1878, to June 30, 1878, per 100 pounds for the whole distance.	Do.
Do	Edward Fenlon	June 23, 1877	Route No. 1, Caddo to Fort Sill, Ind. Ter., 157 miles	$2 10 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	December 31, 1877.
Do	do	June 23, 1877	Route No. 2, Wichita, Kans, to Fort Reno, Ind. Ter., 164 miles.	$2.20 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	A. E. Reynolds	June 23, 1877	Route No. 3, Dodge City, Kans., to Fort Elliott, Tex., 184 miles.	$2.25 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	E. B. Allen	June 23, 1877	Route No. 4, El Moro, Colo., to Santa Fé, N. Mex , 221 miles.	$2.05 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 5, El Moro, Colo., to Fort Stanton, N. Mex , 328 miles.	$3.05 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 6, El Moro, Colo., to Fort Craig, N. Mex , 381 miles.	$3 54 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 7, El Moro, Colo., to Fort Wingate, N. Mex., 391 miles.	$3.63 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 8, El Moro, Colo., to Fort Selden, N. Mex., 466 miles	$4.33 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 9, El Moro, Colo., to Fort Bayard, N. Mex., 559 miles.	$5.19 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 23, 1877	Route No. 10, El Moro, Colo., to Camp Apache, Ariz., 534 miles.	$4 96 per 100 pounds for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Col. Rufus Ingalls, chief quartermaster Military Division of Pacific, and Department of California, San Francisco, Cal.	James M Barney	June 25, 1877	From San Francisco, Cal., to Yuma Depot, Ariz.	2.35 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Ehrenberg, Ariz.	3 25 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Mohave, Ariz.	4.25 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.

Abstract of contracts for wagon-transportation entered into by the Quartermaster's Department, &c.—Continued.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rate.	Date of expiration of contract.
Col. Rufus Ingalls, chief quartermaster Military Division of Pacific, and Department of California, San Francisco, Cal.	James M. Barney	June 25, 1877	From San Francisco, Cal., to Camp McDowell, Ariz.	6.10 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	December 31, 1877.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Lowell, Ariz.	7.05 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Grant, Ariz.	8.36 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Bowie, Ariz.	8.72 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Thomas, Ariz.	9.56 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Apache, Ariz.	11.87 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Whipple Depot, Ariz.	6.36 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From San Francisco, Cal., to Camp Verde, Ariz.	7.20 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp McDowell, Ariz.	3.93 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp Lowell, Ariz.	4.91 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp Grant, Ariz.	6.79 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp Bowie, Ariz.	6.65 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp Thomas, Ariz.	7.52 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Yuma, Cal., to Camp Apache, Ariz.	9.52 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Ehrenberg to Whipple Depot, Ariz.	3.27 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	do	June 25, 1877	From Ehrenberg to Camp Verde, Ariz.	4.15 cents per pound for the whole distance, from July 1, 1877, to December 31, 1877.	Do.
Do	J. S. Rothschild	Mar. 11, 1877	San Francisco to Camp Independence, Cal.	$5.50 (coin) per 100 pounds during the months of July, August, and September, 1877, and April, May, and June, 1878; $5.90 (coin) per 100 pounds during the months of October, November, and December, 1877, and January, February, and March, 1878, for the whole distance.	June 30, 1878.
Do	Irvin Ayres	Mar. 13, 1878	Reno, Nev., to Camp Bidwell, Cal.	$2.56 per 100 pounds during the months of July, August, and September, 1877, and April, May, and June, 1878; $4.20 per 100 pounds during the	Do.

				months of October, November, and December, 1877, and January, February, and March, 1878, for the whole distance.	
Do	Thomas Bair	Mar. 13, 1878	From San Francisco to Camp Gaston, Cal.	$1.95 per 100 pounds during the months of July and August, 1877, and May and June, 1878; $2.25 per 100 pounds during the months of September and October, 1877, and April, 1878; $3.50 per 100 pounds during the months of November and December, 1877, and January and February, 1878; $3 per 100 pounds for the month of March, 1878, for the whole distance.	Do.
Do	do	Mar. 13, 1878	From Arcata to Camp Gaston, Cal.	$1.70 per 100 pounds during the months of July and August, 1877, and May and June, 1878; $2 per 100 pounds during the months of September, October, November, and December, 1877, and January, February, March, and April, 1878, for the whole distance.	Do.
Do	John Thomas Smythe	Mar. 13, 1878	Hauling in city of San Francisco, Cal.	32½ cents per ton measurement, or 42½ cents per ton weight.	Do.
Do	S. Reinhart	Mar. 13, 1878	San Francisco, Cal., to Camp McDermitt, Nev.	$1.40 (coin) per 100 pounds for the whole distance	Do.
Maj. M. I. Ludington, chief quartermaster, Department of the Platte, Omaha, Nebr.	John B. Boutware	June 25, 1877	From Corinne, Utah, to Fort Hall, Idaho, 150 miles.	$1.25 per 100 pounds during the months of July and August, 1877; $1.45 per 100 pounds for September, 1877; $1.75 per 100 pounds for October, 1877; $2.90 per 100 pounds for November, 1877; and $6 90 per 100 pounds for December, 1877, for the whole distance.	December 31, 1877.
Do	G. H. Jewett	June 25, 1877	Sidney to Camp Sheridan, Nebr., 138 miles.	$1.65 per 100 pounds during the months of July, August, September, and October, 1877; $2.25 per 100 pounds during the months of November and December, 1877, for the whole distance.	Do.
Do	J. S. Lewis, W. T. Van Dorn, and G. W. Lashus.	June 25, 1877	From York, the present southern terminus of the Utah Southern Railroad, to Fort Cameron, Utah, 155 miles.	$1.50 per 100 pounds for the whole distance	Do.
Do	C. Hecht	June 25, 1877	From Cheyenne depot to Fort Laramie, Wyo., 90 miles.	$1.03 per 100 pounds during the months of July, August, September, and October; $1.39 per 100 pounds during the months of November and December, for the whole distance.	Do.
Do	do	June 25, 1877	From Cheyenne to Fort Fetterman, Wyo., 171 miles.	$1.71 per 100 pounds during the months of July, August, September, and October; $2.29 per 100 pounds during the months of November and December, for the whole distance.	Do.
Do	do	June 25, 1877	From Cheyenne to Cantonment Reno, Wyo., 201 miles.	$2.73 per 100 pounds during the months of July, August, September, and October; $3.69 per 100 pounds during the months of November and December, for the whole distance.	Do.
Do	E. Fenlon	June 25, 1877	From Sidney to Camp Robinson, Nebr, 96 miles.	$1.35 per 100 pounds during the months of July, August, September, and October; $1.80 per 100 pounds during the months of November and December, for the whole distance.	Do.

Abstracts of contracts for wagon-transportation entered into by the Quartermaster's Department, &c.—Continued.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rate.	Date of expiration of contract.
Maj. M. L. Ludington, chief quartermaster, Department of the Platte, Omaha, Nebr.	W. P. Noble	June 25, 1877	Bryan or Green River Station to Camp Stambaugh, Wyo., 100 miles.	$1.12½ per 100 pounds during the months of July, August, September, and October; $1.50 per 100 pounds for November; $3 50 for December, for the whole distance.	December 31, 1877.
Do	do	June 25, 1877	Bryan to Camp Brown, Wyo	$1.73 per 100 pounds during the months of July, August, September, and October; $2.25 per 100 pounds for November; $5.25 for December, for the whole distance.	Do.
Do	Augustus and Charles Trabing.	June 25, 1877	Medicine Bow or Rock Creek Station to Fort Fetterman, Wyo.	$1.05 per 100 pounds during the months of July and August; $1.15 per 100 pounds for September; $1.25 per 100 pounds for October; $1.45 per 100 pounds for November, for the whole distance.	Do.
Do	do	June 25, 1877	Medicine Bow to Cantonment Reno, Wyo.	$2 per 100 pounds during the months of July and August; $2.25 per 100 pounds during the month of September; $2.35 per 100 pounds for October; $2.60 per 100 pounds for November, for the whole distance.	Do.
Do	Fred. J. Kiesel	Jan. 3, 1878	From Corinne, Utah, to Fort Hall, Idaho, 140 miles.	$4 90 per 100 pounds during the months of January, February, and March; $4 per 100 pounds during the month of April; $1.75 per 100 pounds during the months of May and June, for the whole distance.	June 30, 1878.
Do	John S. Lewis	Jan. 3, 1878	Franklin Station (the present northern terminus of the Utah Northern Railroad) to Fort Hall, Idaho, 104 miles.	$5 per 100 pounds for the month of January; $4 per 100 pounds for February; $3 per 100 pounds for March; $2 per 100 pounds for April; $1.25 per 100 pounds for May; $1 per 100 pounds for June, for the whole distance.	June 30, 1878.
Do	A. H. Reed	Jan. 3, 1878	From Cheyenne Depot to Fort Laramie, Wyo., 86 miles.	$1.40 per 100 pounds during the months of January, February, March, and April; $1 per 100 pounds during the months of May and June, for the whole distance.	Do.
Do	do	Jan. 3, 1878	From Cheyenne Depot to Fort Fetterman, Wyo., 107 miles.	$2.25 per 100 pounds during the months of January, February, March, and April; $1.70 per 100 pounds during the months of May and June, for the whole distance.	Do.
Do	do	Jan. 3, 1878	From Cheyenne Depot to Fort McKinney, Wyo., 258 miles.	$3.75 per 100 pounds during the months of January, February, March, and April; $2.70 per 100 pounds during the months of May and June, for the whole distance.	Do.
Do	John S. Lewis	Jan. 3, 1878	York Station (the southern terminus of the Utah Southern Railroad) to Fort Cameron, Utah, 140 miles.	$2 per 100 pounds during the months of January, February, and March; $1.75 per 100 pounds during the month of April; $1.50 per 100 pounds during the months of May and June, for the whole distance.	Do.

Do	John B. Hindey	Jan. 3, 1878	Sidney to Camp Robinson, Nebr., 120 miles.	$1.91 per 100 pounds, for the whole distance	Do.
Do	do	Jan. 3, 1878	Sidney to Camp Sheridan, Nebr., 162 miles.	$2.34 per 100 pounds, for the whole distance	Do.
Do	W. P. Noble	Jan. 3, 1878	From Bryan or Green River Station to Camp Stambaugh, Wyo., 100 miles.	$3.50 per 100 pounds during the months of January, February, March, and April; $1.15 per 100 pounds during the months of May and June, for the whole distance.	Do.
Do	do	Jan. 3, 1878	From Bryan or Green River Station to Camp Stambaugh, Wyo., 147 miles.	$5.50 per 100 pounds during the months of January, February, March, and April; $1.75 per 100 pounds during the months of May and June, for the whole distance.	Do.
Do	A. H. Reed	Apr. 1, 1878	Medicine Bow or Rock Creek Station to Fort Fetterman, Wyo., 85 miles.	$1.55 per 100 pounds during the month of April; $1.05 per 100 pounds for May, and 95 cents for June, for the whole distance.	Do.
Do	do	Apr. 1, 1878	Medicine Bow or Rock Creek Station to Fort McKinney, Wyo., 176 miles.	$3.10 per 100 pounds during the month of April; $2.10 per 100 pounds for May, and $1.90 per 100 pounds for June, for the whole distance.	Do.
Lieut. Col. A. J. Perry, chief quartermaster Department of Texas, San Antonio, Tex.	H. B. Adams	July 1, 1877	From San Antonio or any point on the Gulf, Western Texas and Pacific Railway, or the Galveston, Harrisburg and San Antonio Railway, or the Houston and Texas Central Railway, at Austin, to any point in the State of Texas north of parallel 27° and south of parallel 32°.	Sixty-nine cents per 100 pounds per 100 miles	December 31, 1877
Do	W. J. Carson	Aug. 7, 1877	From Fort Worth, Tex., or any point on the Texas Pacific Railroad, or Denison, or any point on the Missouri, Kansas, and Texas Railroad in the Department of Texas, to any point in the State of Texas east or west of the Brazos River, and north of parallel 31°.	$1.42½ per 100 pounds per 100 miles, from Fort Worth to Forts Richardson and Griffin, Tex.; $1.15 per 100 pounds per 100 miles, from Fort Worth to Forts Concho and McKavett, Tex.	June 30, 1878.
Do	H. B. Adams	Jan. 23, 1878	From San Antonio, or any point on the Gulf, Western Texas and Pacific Railway, or the Galveston, Harrisburg and San Antonio Railway, or the Houston and Texas Central Railway, at Austin, to any point in the State of Texas north of parallel 27° and south of parallel 32°.	89 cents per 100 pounds per 100 miles	Do.
Do	W. J. Carson	Jan. 23, 1878	From Fort Worth or Fort Denison, Tex., to Forts Richardson, Griffin, McKavett, or Concho, Tex.	$1.19 per 100 pounds per 100 miles	Do.

Abstracts of contracts for wagon transportation entered into by the Quartermaster's Department, &c.—Continued.

Names of officers.	Names of contractors.	Date of contract.	Route of supply.	Rate.	Date of expiration of contract.
Lieut.-Col. A. J. Perry, chief quartermaster Department of Texas, San Antonio, Tex.	Thomas Carson	Jan. 23, 1878	From Brazos Santiago to Fort Brown, Tex., or return.	$2 for officers and employés.....	June 30, 1878.
			.....do	$1.50 for enlisted men and laundresses.....	
			.....do	24 cents per 100 pounds for stores and supplies....	
			From Brazos Santiago to Ringgold Barracks, Tex., or return.	$12 for officers and employés.....	
			.....do	$7.50 for enlisted men and laundresses.....	
			.....do	50 cents per 100 pounds for stores and supplies ...	
			From Brazos Santiago to Fort McIntosh, Tex.	$1.50 per 100 pounds.....	
			From Fort Brown to Ringgold Barracks, Tex.	26 cents per 100 pounds.....	
			From Ringgold Barracks to Fort McIntosh, Tex., or return.	$1 per 100 pounds.....	
Lieut.-Col. C. H. Tompkins, chief quartermaster Department of Dakota, Saint Paul, Minn.	Louis H. and William T. Maxfield.	Feb. 9, 1878	From Breckenridge, Minn., or Jamestown, Dak., or other posts on the Missouri River, Dakota Territory, eastward or northward, or from any point on the Saint Paul and Pacific Railroad, or the Northern Pacific Railroad and its branches, or from any point in the State of Minnesota, and that part of Dakota Territory lying north and east of the Missouri River, to any of the posts that are now or may be established in the State of Minnesota, or in that portion of Dakota Territory bounded by and lying north and east of the Missouri River.	$1.21 per 100 pounds per 100 miles, from April to October, 1878, inclusive; $1.25 per 100 pounds per 100 miles, from November, 1878, to March, 1879, inclusive.	March 31, 1879.
Do.....	John W. Power	Mar. 20, 1878	From Fort Benton, Mont., or any point in the Military District of Montana on the Missouri River, or at Corinne, Utah, or other station on the Union Pacific or Utah Northern Railroads to any point in the Territory of Montana.	$1.14¼ per 100 pounds per 100 miles, within prescribed limits, and $1.17 outside of limits, from April 1, 1878, to March 31, 1879.	Do.

Lieut. W. T. Duggan, Tenth Infantry, acting assistant quartermaster, Fort McIntosh, Tex.	C. M. Macdonell.....	Aug. 2, 1877	Hauling building material, lumber, &c, for the erection of two buildings at Fort McIntosh, Tex., from Corpus Christi, Tex , to Fort McIntosh.	$35 per 1,000 feet of lumber, and $1.12½ per 100 pounds of other material.	

Official:
QUARTERMASTER-GENERAL'S OFFICE,
September, 19, 1878.

J. D. BINGHAM,
Deputy Quartermaster-General, U. S. Army.

WAR DEPARTMENT,
Washington City, September 6, 1878.

SIR: I have the honor to transmit herewith, for the use of your commission, the report of Lieut. S. R. Whitall, Sixteenth Infantry, of the result of the experiment, commenced about ten months since, of employing Indian prisoners at farm and garden labor.

Very respectfully, your obedient servant,

GEO. W. McCRARY,
Secretary of War.

CHARLES L. FLANAGAN, Esq.,
Secretary of the Joint Commission on the Transfer of the Indian Bureau,
Washington, D. C.

HEADQUARTERS, FORT SILL, IND. T.,
August 9, 1878.

SIR: I have the honor to report that the Indian prisoners who have been working the military farm, under the supervision of the troops, for the past year, together with the farm and all its belongings, of houses, cattle, crops, &c., were turned over, according to agreement, to the United States Indian agent, Colonel Hunt, on the 1st instant.

The accompanying report of the officer in immediate charge of the prisoners and farm (Lieutenant Whitall, Sixteenth Infantry), marked A, will show the very satisfactory results obtained and the fact that the Indians can, under proper management, be taught such industrial pursuits as will enable them to become self-sustaining.

This farm was started by my predecessor, General Mackenzie, who thought it better to put these prisoners at work for their benefit, under the charge of the troops, than to keep them in the guard-house, to be turned out at the expiration of their confinement probably more devilish than before. Now, the results put them in as good, if not better, condition than any equal number of Indians on the reservation. The credit it therefore due General Mackenzie, the projector, and Lieutenant Whitall, the executor, of the design. I simply carried out—certainly, however, with great energy—the plan.

Very respectfully, your obedient servant,

J. W. DAVIDSON,
Lieutenant-Colonel Tenth Cavalry, Commanding.

The ASSISTANT ADJUTANT-GENERAL,
Department of the Missouri, Fort Leavenworth, Kans.

HEADQUARTERS, FORT SILL, IND. T., *August* 2, 1878.

SIR: In compliance with Special Orders No. 161, current series, of this post, I have the honor to report that I turned over to the United States Indian agent, Col. P. B. Hunt, on the 1st instant, the Indian prisoners who have been under my charge for the past ten months. Their numbers are as follows, viz: 15 men, 18 women, and 11 children. Total, 44 present. Absent, 1 man, 1 woman, at Fort Smith, Ark., in the hands of civil authorities. Three men, 5 women, and 3 children absent without leave, and 1 woman and 1 child absent with leave. Total absent, 15. Total number of prisoners 59—men, women, and children. These Indians have been kept constantly engaged in various ways as farm-laborers for a little less than a year, say ten months, and in that time they have cut and split between 8,000 and 9,000 rails, with which they built a substantial worm fence, six rails high, staked and ridered, around three sides of their farm, inclosing just about 100 acres of plowed ground. The fourth or east side is bounded by Cache Creek, along which they have constructed a good brush fence, cattle-proof. Their farm, including the meanderings of the creek, contains about 200 acres of land. The cultivated portion of this contains about 80 or 85 acres, planted in corn, which, from its present appearance, will yield about 30 bushels to the acre. The remaining 10 or 15 acres are planted in sweet-potatoes, sugar-cane, or sorghum, pumpkins, tomatoes, peppers (Chili-Colorado), watermelons, squash (three varieties), onions, and radishes. The yield of melons was very large, of which the Indians are extremely fond and consume an immense quantity. They have also sold so far a great many in the post, besides which hundreds have rotted on the ground, which could not be consumed by them. I would estimate the yield of sweet-potatoes at 400 bushels, which is, I think, a low estimate. Five hundred fruit-trees were purchased from their ration fund, and planted in two orchards, which are fenced. Seventy-five chickens, besides many other useful articles for household purposes—chairs, bedsteads, tin-ware, crockery, and cookery utensils, &c.—have been purchased for them at various times.

I turned over to the Indian agent 91 head of cattle belonging to them, purchased by General Mackenzie with money received from the sale of their ponies. The original

number was 100, of which 13 died last winter, which left but 87 head. Four calves have since been born, which makes the total 91 turned over to the agent as their property.

There are two good picket-houses 21 by 30 feet square, on stone foundations, and containing four rooms each; the houses are double, and intended to hold in all four families. They were built by the labor of the troops, assisted as much as possible by the Indians. The lumber used in their construction was cut at the agency saw-mill. The plowing, fence-building, cultivation of their crops, &c., was almost entirely done by them, and a number of the men are as good plowmen as will be found among the laboring class of white men in this country. The rails for the fence were cut and split entirely by the men, none of the women being allowed to do this work. The total number of men at the time the rails were made, not counting two old men, was 19. About 14 of these men made all the rails, the remaining 5 were employed with their squaws in clearing off the land for the farm. They commenced by being made to split 30 rails a day each, and this number was increased gradually up to 60 rails per man a day, which task they readily accomplished. The guard over them was generally only two or three soldiers most of the time when at this work. If I may be allowed to express an opinion from the short experience I have had with these few Indians, based on the general results of their labor during ten months, I would say that if all of the able-bodied men on this reservation were made to work, as these people have been made to do, that in a few years' time they could be made to sustain themselves, at least partially. They should be liberally supplied with the proper farming implements, proportioned to their numbers—plows, harrows, hoes, and rakes (iron), harness, wagons, axes, and hatchets, all strong and substantial, made to be used by awkward hands; and with suitable persons constantly at hand who are capable to show them what to do, and how to do it, and who must have the necessary patience to bear kindly with their mistakes and failures until they learn. The results of their labor would soon begin to show in small farms, properly fenced and cultivated, where now a very few of them, in proportion to their whole number and those generally some of the headmen, pretend to cultivate very small patches of corn.

Their ponies, of which they still have a great many, should most of them be sold as the first step, and cattle purchased with the proceeds. This would deprive them of their principal means of going to war, or leaving the reservation for any great length of time, as they cannot move their families without ponies, and only a few could run off if they got tired of work, and they would soon be compelled to come back, as they cannot subsist themselves in small numbers. This was shown to be the case with the six or eight prisoners who ran away from me; they were all compelled to come back to the reservation, and were brought in and turned over by their chiefs. The easiest and quickest way to civilize them is by making them work to obtain food until they can subsist themselves, then give them the missionary, and allow them to say what particular denomination they prefer.

Very respectfully, your obedient servant,

S. R. WHITALL,
Second Lieutenant Sixteenth Infantry, in charge of Indian Prisoners.

To POST ADJUTANT,
Fort Sill, Ind. T.

Inclosed please find statement of Indian prisoners' fund account.

Balance sheet.—Indian prisoners' fund account.

Date.	Amount received.		Date.	Amount expended.	
1877.			1877.		
Sept. 30	To savings on rations and other sources	$51 48	Sept. 30	By amount expended	$44 87
Oct. 31	....do	90 27	Oct. 31	....do	74 36
Nov. 30	....do	95 10	Nov. 30	....do	63 62
Dec. 31	....do	82 51	Dec. 31	....do	70 30
1878.			1878.		
Jan. 31	....do	77 38	Jan. 31	....do	73 13
Feb. 28	....do	71 45	Feb. 28	....do	63 40
Mar. 31	....do	106 76	Mar. 31	....do	109 35
Apr. 30	....do	95 96	Apr. 30	....do	141 15
May 31	....do	186 33	May 31	....do	78 15
June 30	....do	112 13	June 30	....do	194 00
July 31	....do	121 81	July 31	....do	178 85
		1,091 18			1,091 18

The money was expended for beef over their rations, tobacco, fruit-trees, chickens, clothing, cooking utensils, bedding, furniture, garden-seeds, &c.

I certify that the above account is correct.

S. R. WHITALL,
Second Lieutenant Sixteenth Infantry.

[First indorsement.]

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
ASSISTANT ADJUTANT-GENERAL'S OFFICE,
Fort Leavenworth, Kans., August 15, 1878.

Respectfully forwarded to the Adjutant-General of the Army (through headquarters Military Division of the Missouri) for the information of higher authority.
In the absence of the brigadier-general commanding,

E. R. PLATT,
Assistant Adjutant-General.

[Second indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, August 20, 1878.

Respectfully forwarded to the Adjutant-General of the Army.
In the absence of the Lieutenant-General commanding.

WM. D. WHIPPLE,
Assistant Adjutant-General.

Official copy.

E. D. TOWNSEND,
Adjutant-General.

ADJUTANT-GENERAL'S OFFICE, *Sept.* 4, 1878.

To accompany 5th indorsement on 5958, Adjutant-General's Office, 1878.

WAR DEPARTMENT,
Washington City, October 16, 1878.

SIR: I have the honor to transmit herewith, for the information of the Joint Committee on the Indian Bureau Transfer, a list of names of Indians at the Santee Agency, Nebraska, who voted in favor of transfering the Indians to the War Department, at an election held at that place August 20, 1878, forwarded by Lieutenant-Colonel Lugenbeel, First Infantry.

Very respectfully,

G. W. MCCRARY,
Secretary of War.

Hon. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Indian Bureau Transfer.

SANTEE AGENCY, NEBR., *September* 19, 1878.

At an election held on Santee Agency, Nebr., August 20, 1878, on the proposition to transfer the Indians from the Interior to the War Department, the following voted in favor of the transfer, and respectfully ask that the same be placed before the proper authorities:

Napoleon Wabashaw, head chief.
George Red Owl, chief.
Phillip Webster, chief.
John M. Land.
Job Good Teacher.
Benjamin Whipple.
Simon Mazakute.
Thomas Whipple.
William Dilk.
Dilkmaripiyalakayiymani.
John Large Star.
Joseph Chapman.
James Sharps.
John B. Chapman.
George Red Owl.
Johnson Red Owl.
Alexander Tay Tay.
John Bill.
Ambrose Thomas.
Daniel Talepehe.
Samuel Howley.
Daniel Pt-go mam.
Joseph Tay Tay.
Paul Johnson.
Eugene Hoffman.
Reuben Hillers.
Fork H. Johnson.
John T. Hoffman.
Samuel Thomas.
Joseph Wabashaw.
Andrew Sherman.
Andrew Johnson.
Catanno John Hoffman.
John C. Tuttle.
William H. Saul.
Ben. Wankanhditanka.
Waziduta.
A. Ricitawakan.
Cammpesan.
John B. Wapaha.
Lewis Samuel.
Van L. Sam.
Charles Barker.
Joseph W. Godfrey.
Alexander White.
Mazakinyemani.
Daniel Whole.
Charley Jenks.
Anpeturota.
Charles Plegoman.
Duncan Stone.
Thomas Redwing.
Redwing Wakute.

Morpiya duta.
O'Raze.
Edward Ross.
Cinske O'Roze.
Lefian H. Dokeze.
Nyan hok sii ot.
Simon P. Stone.
Ta'lan Ru Waxte.
John T. Chapman.
James W. Crow.
Chaska Chapman.
James Redwing.
Ulysses Zimmerman.
Napepa.
Charle Henry.
Joe William.
Marpiyaehua.
James Bernit.
Kasin.
James M. Pay Pay.
Mazamard.
Charles Stand Soldier.
Samuel Henry Lepi.
Samuel H. Wells.
John Crow.
Jame Black Eagle.
Amos Ross.
Moses Hunter.
Mrr hakewuxte.
Marpi icah'dawm.
Marpi wakeanan.
Ediz Smith.
Marpizalokaya.
Samuel Red Wing.
John Wakinyancatke.
Wakanhdinapedan.
James Chapman.
James L. Hemans.
Charles Mazazidan.
Napoleon Wabashaw.
Hu'sa'sa.
Majitanimzaupe.

[First indorsement.]

HEADQUARTERS, FORT RANDALL, DAK.,
September 21, 1878.

At the request of these signers I have respectfully to forward the within memorial to division headquarters.

PINKNEY LUGENBEEL,
Lieutenant-Colonel First Infantry, Commanding Post.

[Second indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, September 27, 1878.

Respectfully forwarded to the Adjutant-General of the Army as requested, but no significance should be attached to such action, as this is a matter in which the Army is not at present concerned.

P. H. SHERIDAN,
Lieutenant-General, Commanding.

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, October 11, 1878.

Official copy:

E. D. TOWNSEND,
Adjutant-General.

For the Joint Committee on the Indian Bureau Transfer.

HEADQUARTERS FORT STEVENON, DAK.,
September 4, 1878.

SIR: At the request of Son of the Star, only chief of the Rees, and of Bull Head, one of the principal men, I submit the following statement made by the former:

"I have come down to make my statement in regard to our agents, as in the council held with our present agent in reference to our transfer to the War Department I allowed myself to be controlled by the Mandans and Gros Ventres, whom I had told that, as I had always spoken first, they would have to decide this question. After the council, and after I understood its purpose, I saw a mistake had been made, spoke of it, and through Mr. Girard, his interpreter, requested General Hammond, the Indian inspector, to forward my views, which I believe he did. The best agent we ever had was Captain Clifford, an Army officer, who took better care of our old people and children than any other. The Mandan chiefs Roan Cow and Bad Gun some time ago asked me, through their Indian interpreter, to come down and make this statement. This is all I have to say."

In reply to my questions as to certain language used in the council, held on the 3d ultimo, to consider the question of the transfer, he denied the accuracy of the interpretations, and stated he had been deceived principally through the representations of the missionary and Indian trader at Berthold.

The agent informs me, unofficially, that the Indians had two reasons to give against the transfer, viz: 1 "The benefit of the Army to protect them against fraud; and, 2, the tyranny of the War Department if they had the sole control"; and that he so informed the Indian Commissioner in the letter transmitting the decision of the Indians.

I am, sir, very respectfully, your obedient servant,

J. R. SCHINDEL,
Captain Sixth Infantry, Commanding.

ASSISTANT ADJUTANT-GENERAL,
Headquarters Department of Dakota, Saint Paul, Minn.

[First Indorsement.]

HEADQUARTERS, DEPARTMENT OF DAKOTA,
Saint Paul, Minn., September 10, 1878.

Respectfully forwarded to headquarters Military Division of the Missouri.

Where white men differ so widely in regard to this question of transfer, I doubt the value of opinions obtained from Indians regarding an experiment of which they know nothing, and I should doubt still more the evidence of such opinions received through interested agents and interpreters.

JOHN GIBBON,
Colonel Seventh Infantry, Commanding.

[Second Indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, September 14, 1878.

Respectfully forwarded to the Adjutant-General of the Army.

P. H. SHERIDAN,
Lieutenant-General, Commanding.

Official copy.

E. D. TOWNSEND,
Adjutant-General.

ADJUTANT-GENERAL'S OFFICE, *September* 25, 1878.

WAR DEPARTMENT,
Washington City, October 18, 1878.

SIR: I have the honor to transmit herewith, for the information of the Joint Committee on the Indian Bureau Transfer, a copy of a communication, dated the 31st August last, from the commanding officer Fort Lapwai, Idaho, reporting that at a council of the Nez Percé Indians on the Lapwai Reservation, convened by order of the Acting Commissioner of Indian Affairs, 117 voted for transfer to the War Department and 6 against it; that many of the Indians are now under the impression they are under the control of the military, and desire a talk with General Howard.

Very respectfully, your obedient servant,

G. W. MCCRARY,
Secretary of War.

HON. ALVIN SAUNDERS, U. S. S.,
Chairman Joint Committee on Indian Bureau Transfer.

FORT LAPWAI, IDAHO,
August 31, 1878.

SIR: At the urgent solicitation of James Lawyer, chief of the Nez Percé Indians, and other subchiefs of the tribe, I attended a general council of the Indians held at the agency on the 28th instant. I had neither received an intimation that such council was to be held from Mr. Monteith, the agent, nor had I an invitation from him to attend it. The council was convened by order of the Acting Commissioner of Indian Affairs, and its object was to find out whether the Indians were in favor of being transferred to the War Department or remain under the control of the Interior Department. All the representative men of the tribe were present, and after a full discussion of the subject a vote was taken, which resulted in 117 votes being cast for transfer to the War Department against 6 votes against it.

The trouble is, however, that many of the Indians think now that this is the end of the matter, and that the officers have control of them. Many of them have been to see me, in some cases asking for permits to leave the reservation, &c. I have invariably tried to make them understand that before Congress acts on the question they remain under the control of their agent. James Lawyer, Jonah, and many of the tribe now desire me to write you and say they are sick at heart and would like to have a talk with General Howard; that such talk would satisfy their people and make glad their hearts. They do not seem to feel very friendly toward their agent, though I do not know their reasons therefor fully. I promised I would write General Howard their request for such action as he may deem necessary.

Very respectfully, your obedient servant,

WM. FALCK,
Captain Second Infantry.

ACTING ASSISTANT ADJUTANT-GENERAL,
District of the Clearwater, Walla Walla, Wash.

Indorsements.

Official copy respectfully furnished to the Adjutant-General of the Army (through headquarters Military Division of the Pacific) for the information of the War Department.

O. O. HOWARD,
Brigadier-General, Commanding.

HEADQUARTERS DEPARTMENT OF THE COLUMBIA,
September 17, 1878.

HEADQUARTERS MILITARY DIVISION PACIFIC
AND DEPARTMENT CALIFORNIA,
Presidio of San Francisco, September 23, 1878.

Respectfully submitted to the division commander, No. 10 West Ninth street, New York.

J. C. KELTON,
Lieutenant-Colonel, Assistant Adjutant-General.

HEADQUARTERS DIVISION PACIFIC
AND DEPARTMENT CALIFORNIA,
October 1, 1878.

Respectfully forwarded.

IRVIN McDOWELL,
Major-General C. D. & D.

Letter from General Nelson A. Miles.

WASHINGTON, D. C., *December* 17, 1878.

Hon. A. SAUNDERS, *United States Senate:*

SIR: In answer to your request I have the honor to submit the following views regarding the Indian question:

The relations existing between the two races in this country at the present time is simply the result of two hundred years of warfare, of bad faith, and mismanagement. As a people and a government, we have on our hands about 250,000 Indians that are in the main a constant source of great expense and annoyance. To avoid such wars as have frequently occurred in the past few years, the evils of which cannot be estimated, to better the condition of the Indians, save the government millions of money annually, to give protection to life and property along our extensive frontier, I would for the following reasons renew the recommendations I have frequently made in official communications on the subject:

First. No body of people can be successfully governed without some physical government. To continue the present system is to promote lawlessness and endanger the settlements to murder and devastation.

Second. The change from barbarism to civilization must be constant and gradual, and in accordance with nature's laws.

Third. The education, civilization, and christianization must be mainly through the rising generation, and to make them in turn intelligent governors and instructors they should be under proper influences. I believe the honorable Secretary of the Interior is doing everything in his power to reform that branch of the public service, yet he has not the means of controlling the large tribes who are hostile or in a semi-hostile condition, and whose warriors are fully armed and numbered by thousands. I would recommend that a stronger government *be tried at least for a few years.* Allowing the civilized and semi-civilized who are living within the settlements or in the eastern part of the Indian Territory to remain as at present, I would recommend—

First. That the nomadic tribes, who are now fully mounted and armed, namely, the Sioux, Assinaboines, Gros Ventres, Crows, Piegans, Arapahoes, Cheyennes, Kiowas, Comanches, Apaches, Navajoes, Bannocks, Spokanes, Umatillas, Blackfeet, and other like roaming tribes, be placed under the control of the War Department.

Second. That the honorable Secretary of War be directed to detail officers of known experience and integrity to have charge of these tribes and that the appropriations made by Congress be disbursed in such a way as to do the Indians the greatest good, preserve their loyalty, and to enable them to become self-sustaining.

Third. That the military forces shall be used to enforce treaties made with the Indians to keep them on their reservations or within the terms of their treaties, to prevent intrusions by white men upon Indian reservations, and to protect the Indians in their rights of person and property.

Fourth. That the Secretary of War be authorized to make use of any unoccupied buildings at military posts for the stores and property of Indians; that any public ani-

mals or transportation not otherwise employed may be used in the breaking of ground and the preparing of gardens and farms for localizing the Indians.

Fifth. That the unoccupied military posts may be used for the establishment of industrial schools where the children of the different tribes may be sent and taught the English language, habits of industry, and the proper care of domestic stock, the science of agriculture and other useful knowledge that would enable them when of suitable age to become the educators of their race. I recommended several years ago that efforts be made to first make the Indians a pastoral people, as this would be in accordance with their habits and tastes; I also recommended that the educational work be carried on at large schools where the youth could see the benefits and blessings of civilization. If the Indians are herded together in large camps as at present where the children can attend school, indolence, vice, and disaffection are the results. If the Indians are scattered by families on their reservations with their flocks and herds along the valleys, schools are out of the question; hence I urge the establishment of industrial and normal schools near or within the settlements. The military branch of the government are not desirous of undergoing the hardships of these laborious, hazardous, and thankless Indian campaigns, or the terrible risks of an Indian engagement, and would strongly advocate and support any measure of reform. The Army is made up from the families of all people in all parts of the country and every Christian denomination is represented in its numbers, and it cannot be said that it is not in sympathy with any movement that would improve the condition of affairs in the Territories. As the Army has for the past one hundred years been intrusted with important civil duties, particularly the great work of reconstruction, in which the lives and property of over eleven millions of people were involved, it cannot be said that the Army is wanting in sympathy, integrity, or executive ability to administer the affairs of a few thousand Indians with ample and exact justice to all concerned. I would further recommend that Congress define by law the legal status of the Indian as regards the rights of life and property as he becomes civilized and educated. I see no objection under the theory of our government to giving him the rights of citizenship as well as the African or the Asiatic.

I have the honor to remain, with the highest respect,

NELSON A. MILES,
Colonel Fifth Infantry, Bvt. Major-General, U. S. A.

Letter from the Universal Peace Commission.

Will Major Flanagan do us the honor to present this communication to each member of the commission?

Our long and deep interest gives us opportunities and knowledge.

Your friend,

ALFRED H. LOVE.

PHILADELPHIA, *July* 15, 1878.

UNIVERSAL PEACE UNION, AMERICAN BRANCH,
Philadelphia, July 15, 1878.

RESPECTED FRIEND: Please to convey the following to the commission you represent, on the consideration of the transfer of the Indian Bureau to the War Department.

The Universal Peace Union, in executive committee, in the city of Philadelphia, announce:

That from definite and reliable information in our possession, we are convinced that the Indian Bureau should not be transferred to the War Department.

That it is opposed to the animus of free institutions and the spirit of republicanism to subject any race of human beings to the management of the sword power.

Military despotism is the result of superseding the civil by the war administration, and a threatening danger will be constant so long as one child or one community, one race or one nation is kept in subjection by deadly force.

That from experience and statistics, during the past ten years, we are convinced that the peace policy has proved far more economical and conducive to peace and general prosperity than the war policy of previous years; and, although there may have been defection in many of its provisions, and its intentions imperfectly and but partially fulfilled, we can still point with satisfaction to more lands under cultivation by the Indians, more homes and schools established, more general thrift and happiness, and a nearer approach to civilization and a condition to admit to citizenship, than ever before; and we therefore solicit a continuance of this policy until it shall be more thoroughly perfected and entirely relieved of the injurious effects of military menace, and the interference of adventurous and lawless raiders and crafty speculators.

That the extension of the *civil law* over the Indian country is becoming more practicable, and we recommend its speedy introduction, and the cultivation among the Indians themselves of the home principle, and, as far as possible, the administration

of their own affairs by their own people, under the same laws which regulate the other portions of the United States.

That if any change should be made we recommend the establishment of a *peace department* of our government, and the appointment of a distinct cabinet officer to have charge of this interest, with especial attention to all matters connected with the Indians, and to give them a representation from their own sections, and from their different tribes, in the city of Washington, convinced as we are, that nothing goes farther for peace and general welfare than the representation of a people by themselves, whereby they can have some voice in the management of their own affairs.

These, among other reasons, which we feel will be apparent to you, we respectfully and earnestly advise a report from your commission against the transfer of the Indian Bureau to the War Department.

Respectfully,

ALFRED H. LOVE, *President.*

To Major FLANAGAN,
Secretary of the Joint Commission,
United States Senate Chamber.

Attest:
HENRY T. CHILD, M. D., *Secretary.*

UNIVERSAL PEACE UNION, AMERICAN BRANCH,
Philadelphia, October 29, 1878.

RESPECTED FRIEND: The joint commission asked for information. This is from the State of New Jersey. Please present it to the committee; and if you think well of the other States petitioning in like manner I know they are ready to do so.

Some weeks ago I sent a similar memorial from another section to Hon. Carl Schurz, to be given to you.

Your friend, respectfully,

ALFRED H. LOVE,
219 *Chestnut Street.*

Major FLANAGAN,
United States Senate Chamber, Washington, D. C.

At a meeting of the friends of peace, held in Friends' meeting-house, Mount Holly, N. J., Eighthmonth 4, 1878, the following memorial was adopted and ordered to be forwarded to the joint commission to whom was referred the proposition of transferring the Indian Bureau to the War Department.

Pursuant to invitation to all persons who have data or information to convey in relation to this subject, the following is submitted:

From information we have received through various channels, we have reason to regret that this proposition should receive any favor. The progress the Indians have made in education, and the advance many of them have made in civilization, are convincing evidences of the beneficent effect of the peace policy, as inaugurated by President Grant and continued by President Hayes.

From seemingly unavoidable difficulties we are aware that this policy has been but imperfectly and partially administered, and on this account it has not been so complete and satisfactory as it otherwise would have been in its results. The gains made in the extension of schools and the general education of their children; in the cultivation of the soil for the means of support, and in their manifest desire to adopt civilized habits, are confirmatory of the wisdom and righteousness of this peace policy. We therefore hope it may be continued and perfected until it shall be conducted independent of the neutralizing effect of war measures or military menace, and the vicious influence of lawless raiders and unprincipled adventurers.

The feasibility of extending the civil law over the Indian countries can no longer be doubted, and we hope to see it speedily done, and, as far as possible, confided to them the responsibility of conducting their own affairs, under the same laws which regulate the other States and Territories of the Union.

We therefore earnestly implore the commission not to recommend any retrograde step, but report in favor of this peace policy being continued with such improvements, as may perfect its beneficent provisions.

And in this direction we submit that a department might, with great weight and propriety, be added to the government, to be known as the peace department, to have charge especially of the Indian question, and to invite, as far as possible, representatives from the Indians themselves.

Signed on behalf of the meeting.

JAMES S. HULME,
Chairman.

JOS. B. GARWOOD, *Secretary.*

To the Joint Commission on the Indian Bureau bill, care of Major Flanagan, United States Senate Chamber:

At a meeting of the friends of peace, under the auspices of the Pennsylvania Peace Society, held in Friends' meeting-house, Bristol, Bucks County, Pennsylvania, Sixth-month 30, 1878, it was agreed that the disapprobation of the meeting be expressed to the transfer of the Indian Bureau to the War Department; and that the committee appointed by Congress to consult on the subject having solicited an expression of opinion from those interested, be addressed and solicited to report unfavorably to such transfer.

We are assured, from the knowledge we possess of the happy results following the establishment of agencies for educational and religious purposes, having in view the civilization of the Indians and their ultimate recognition as citizens, that the plan is conspicuous for its relations to peace and the establishment of happiness and prosperity among all, and that the perfection of this system, by its further extension and by keeping it free of military surveillance, will eventuate in a settlement of the (so-called) vexed Indian question.

That an extension of civil law throughout the Indian country is desirable, whereby the same law would apply to all persons irrespective of race. That no child or set of children, no persons and no race should be placed under the management of a War Department or a military system. That as an American people, and as citizens of a republic, we would not accept or approve of it for *ourselves*, therefore cannot reconcile its being meted out to others. We see in it a prospective danger by giving to military power a control in legislation that has, in the past, been opposed to the growth of free institutions. That an extended and well-regulated system of peaceful control of the Indian race, through equal justice, human rights, and brotherly love, will prove the most economical and peaceful.

The history of the past ten years, wherein the peace policy has been tested, although not thoroughly perfected, gives us confidence that if carried out in its beneficent intentions, would be far in advance of any military system, and that if any change is desirable we respectfully recommend the establishment of a *distinct bureau*, to be known as the peace department, for the management of the relations with the Indians, to be under the direct management of a separate *cabinet officer*: the prominent conditions of which should involve the same wholesome laws for good order and prosperity as regulate any other race of human beings.

SAMUEL SWAN,
Chairman, Bristol, Pa.

Attest:
WILLIAM PAXSON, *Secretary.*

COMMUNICATIONS FROM THE INTERIOR DEPARTMENT.

DEPARTMENT OF THE INTERIOR,
Washington, September 21, 1878.

SIR: In reply to requests of committee on transfer of the Indian Bureau, I transmit herewith, a statement showing the officers and employés of the Indian Bureau, and the methods of conducting business therein; also, statement showing the views of the various Indian tribes on the question of the transfer as expressed by their chiefs in council assembled.

Very respectfully,

A. BELL,
Acting Secretary.

CHARLES L. FLANAGAN, Esq.,
Clerk Committee on Transfer of Indian Bureau.

Statement showing the methods of conducting business in the Office of Indian Affairs.

OFFICERS AND EMPLOYÉS OF THE INDIAN BUREAU FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

Commissioner.
Chief clerk.
Five chiefs of divisions.
Stenographer.
Forty clerks and copyists.
Two assistant messengers.
One laborer.

The business of the Indian Bureau is carried on in five divisions, as follows, viz:

THE FINANCE DIVISION.
THE ACCOUNTS DIVISION.
THE LAND DIVISION.
THE CIVILIZATION AND EDUCATIONAL DIVISION.
THE FILES AND RECORDS DIVISION.

A chief clerk has supervision over the whole, under the administration of a Commissioner of Indian Affairs.

The following statements show in detail the character and extent of the business which comes before the Indian Bureau, and the manner in which it is transacted in each division.

FINANCE DIVISION.

This division has charge of all financial affairs pertaining to the Indian service; acts upon all questions relating to contracts for supplies and annuity goods for Indians, and the transportation thereof; settles all special accounts for goods, supplies, &c., and makes payment for the same; remits funds to the disbursing officers of the bureau, and conducts all correspondence relating to goods, supplies, &c., and the financial affairs generally of the Indian Office.

In treating of the manner and methods of conducting the "financial" branch of the bureau, it is deemed proper and expedient, both for convenience and in order that the matters hereinafter set forth may be clearly and thoroughly understood, to make the following classification, viz:

I. Purchase of supplies, &c.

II. Settlement of claims or accounts arising under contracts or by open-market transactions.

III. Remittances to disbursing officers of the bureau.

IV. Records of appropriations and expenditures, contracts, &c.

PURCHASE OF SUPPLIES, ETC.

Prior to the act of Congress approved March 3, 1875, which provided that thereafter no purchase of goods, supplies, &c., the cost of which should exceed one thousand dollars, to be paid for from moneys appropriated by said act, should be made except after previous advertisement and contract therefor, large discretion was exercised by the bureau in its purchases for the Indian service. Little regard, in this respect, was paid to then existing laws, and large open-market purchases were frequently made under the "exigency" clause, which did not limit transactions of that character to any specific sum.

Subsequent to the date of said act, the method of purchasing goods, supplies, &c., for Indians has more nearly conformed to the law, but not until the present year has it been fully complied with. At the annual letting in June last contracts were made as far as practicable for all goods and supplies which would be needed during the current fiscal year.

By the act of August 15, 1876 (19 Stats., p. 200, sec. 6), the open-market limit was increased to two thousand dollars in the case of an emergency, and by the act of March 3, 1877 (19 Stats., p. 293, sec. 2), this discretion was further extended so as to permit of purchases in open market to an amount not exceeding five hundred dollars, and in the case of an exigency to an amount not in excess of three thousand dollars. This last-named law was re-enacted by the act of May 27, 1878, and the bureau is conducting its transactions in the matter of purchases entirely in accordance therewith, only in extreme cases availing itself of the three-thousand-dollar limit referred to.

The following is the method of letting contracts for the Indian service:

After due advertisement, upon authority previously obtained from the honorable the Secretary of the Interior, as required by the act of July 15, 1870 (section 3828, Revised Statutes), inviting proposals to furnish annuity goods, supplies, &c., the quantities to be furnished being based upon estimates previously submitted by the various agents of the Indian service, the needs of the Indians, and existing treaty obligations, and the amount of money provided by Congress available for the purpose, sealed bids, in all cases when practicable accompanied by samples of the articles proposed to be furnished, are received and deposited publicly in the presence of the bidder or other person presenting it, in a box locked and sealed, made especially for the purpose, until the time specified for opening of bids. At the proper time said box is opened in the presence of the Commissioner of Indian Affairs, the purchasing committee of the Board of Indian Commissioners, representatives of the Interior Department (these latter being designated by the honorable the Secretary of the Interior), and the usual large assemblage of interested persons who attend the annual letting of contracts for the Indian service. The bids are then taken from said box one at a time, and read publicly by

the Commissioner or a member of the Board of Indian Commissioners; thence they are passed to clerks to be numbered, abstracted, and recorded, after which the officers named, with the abstracts of bids and the samples before them, said samples being divested of all marks that could reveal ownership, and having already being subjected to the scrutiny and examination of reputable and competent inspectors, experts in their several branches of trade, appointed for the purpose *after* the bids are opened, make the awards of contracts upon the advice of the Board of Indian Commissioners, who are in turn advised by experts selected for their technical knowledge of the various kinds of goods offered.

After the awards have been made, contracts are prepared for execution by the successful bidders, which contracts, after receiving the signature of the Commissioner of Indian Affairs, with the necessary bonds for the faithful performance thereof, are forwarded to the executive committee of the Board of Indian Commissioners for their action thereon, as required by law; whence they are passed to the Secretary of the Interior for his approval; thence they are returned to this office for record, after which they are forwarded to the office of the Second Comptroller of the Treasury for file, copies thereof being transmitted to the Second Auditor of the Treasury for his information, as required by the act of March 3, 1875 (18 Stats., p. 450, sec. 7), and to the several agents of this bureau, to whom the supplies covered thereby are to be shipped.

Immediately after the approval of the contract by the proper authorities, and the execution of a bond with proper sureties, shipments of goods, supplies, &c., are ordered. Such articles as flour, corn, wheat, sugar, coffee, &c., which are purchased in large quantities, and usually at points remote from the place of making contracts, are inspected before shipment by competent persons appointed for that purpose, by comparison with the samples upon which the contracts were awarded; and in all cases a strict compliance with the terms of the contract as to quality, &c., is required of contractors. In the case of annuity goods, clothing, blankets, and other articles, which are in most cases deliverable by contractors in New York City, the contractors are required to deliver said articles at the warehouse of this bureau in that city, where the said articles are inspected by reputable experts appointed for that duty, by comparison with the samples upon which the contracts were based, and the quantities are carefully compared with the invoices; thence the said goods are turned over to bonded transporters of the bureau for delivery at their several points of destination.

To insure greater security in the delivery at the agencies of the goods purchased and shipped, each package is stamped by the inspector with his name, and is given a number which must correspond with a number on the invoice of the articles furnished; a copy of this invoice is forwarded by the first mail after shipment of the goods, to the agent for whom they are intended, in order that he may compare quantities, &c., of articles received with the articles invoiced.

These arrangements in detail in the matter of awarding contracts, and the inspection and shipment of goods received thereunder, serve to protect the department from both fraud and error. Great care has been taken to insure the delivery at the several agencies of the goods intended for them, and it is certain that in future exchanges of goods or supplies while *en route* will not occur.

SETTLEMENT OF CLAIMS OR ACCOUNTS.

Great improvement has been effected within the past few years in the manner of the settlement and payment of accounts for goods, supplies, services, &c. Formerly all payments of this class of accounts were made by the superintendents and Indian agents, except for the goods, &c., purchased at the annual letting of contracts, which covered only a portion of the yearly purchases. About the commencement of the fiscal year 1877 (July 1, 1876), the system of making payment through the office for all goods, &c., was adopted, excepting in isolated cases where the interests of the service were better subserved by direct payment through its agents. Additional checks and safeguards were originated and carried into effect in the matter of the inspection of and receiving and receipting for supplies, until now it is impossible, without detection, for improper or false payments to be made.

In the payment for supplies furnished under contracts, excepting for articles deliverable at agencies by contractors, the contractor must furnish invoices in duplicate of the articles delivered, to which must be attached the certificate of the bureau inspector to the effect that the articles enumerated thereon (describing the packages by numbers and marks), are equal in quality to the samples upon which the contract was awarded, and he must also furnish the receipt of the transportation contractor for the packages covered by said invoices, describing the same by numbers and weight. Upon presentation of these invoices the contractor's account is adjusted by the Indian Office, the quantities and prices of articles being compared by the examining clerk with the record of the original contract; if found correct, the same is "jacketed" and submitted to the Commissioner for his signature, after receiving which the account is recorded in the "Special Accounts" record; thence it is forwarded to the executive

committee of the Board of Indian Commissioners (in whose office is a record of all contracts) for examination and the necessary action required of them by law, with a view to their approval or otherwise; thence the said account is transmitted by said committee to the Secretary of the Interior for his examination and action thereon, after which the same is returned to this office and a record made on the "Special Account" book, before referred to, of the action of the executive committee and the Secretary of the Interior. The account is then passed by this office to the Second Auditor of the Treasury for adjustment, by whom the same, with his findings thereon, is forwarded to the Second Comptroller of the Treasury for examination, as required by section 273 of the Revised Statutes, who certifies the balance due, and upon whose certificate a requisition on the Secretary of the Interior for said balance is issued by this office; who, in turn, makes requisition on the Secretary of the Treasury for the amount of the said account.

In the case of deliveries by contractors at agencies other forms are used, as follows, viz:

"Receipt" of agent.

"Certificate" of inspector.

Weigher's "return."

Upon which, properly filled out and signed by the receiving, inspecting, and weighing officers, payments are made as hereinbefore described.

Payments for articles purchased in "open market" by agents of the bureau are made after the manner before set forth (all accounts of whatever character undergoing the same process of settlement), upon certified vouchers (duplicates) accompanied by duplicate invoices and transporter's receipts, where articles purchased are not delivered by the seller at the agency.

By a rule of the department, agents of the bureau are required to obtain authority from the head of the department before purchasing any supplies required for the Indian service, except in the case of an absolute emergency or exigency, when necessary articles may be purchased in *small quantities;* but in such cases a good and sufficient explanation (of which this office is the judge) is required to accompany the vouchers presented for payment, fully setting forth the special exigency that made the purchase necessary before obtaining authority.

REMITTANCES TO DISBURSING OFFICERS.

Advances of public funds are made only to bonded officers of the bureau and officers of the Army detailed for duty under the Indian Department, who are required to submit quarterly estimates of the sums that will be necessary to conduct the service at the several agencies within the period covered by their estimates. Funds for the payment of money annuities arising under treaty stipulations are remitted at the commencement of the fiscal year, except in the case of semi-annual payments, when the funds required to make the same are forwarded in the fall and spring of the year. In all other cases the sums advanced are limited to the amount actually required to pay the agents' and employés' salaries, said amounts being based upon the sum set apart for that purpose at the several agencies, by the Secretary of the Interior, in accordance with section 5 of the act of March 3, 1875 (Statutes 18, p. 449), a small amount necessary to pay traveling expenses of the agents and contingent expenses of their agencies, and, in some cases, the amount necessary to pay for supplies in small quantities, the purchase of which by the agents had already been authorized by the department.

RECORDS OF APPROPRIATIONS AND DISBURSEMENTS, CONTRACTS, ETC.

The system of accounting for moneys appropriated by Congress for the Indian Department is very rigid and complete. The record of appropriations under existing treaty obligations with Indians requires the use of nine large ledgers, in which are kept full and complete accounts of all receipts and disbursements of public funds appropriated for the various tribes of Indians. These accounts include not only a record of moneys appropriated by Congress, but also of receipts and disbursements arising from interest collected on bonds held by the government for the benefit of Indian tribes, and from the sale of Indian lands. Copies of all requisitions issued for funds are kept in books prepared especially for that purpose, which show the amount drawn from the Treasury, to whom paid, and the character of the supplies furnished or service performed; or, if advances to disbursing officers, to whom and for what purpose.

Besides the foregoing, the following records are kept in the Finance Division of the Indian Bureau: Of all contracts for the Indian service, whether for supplies, services, or otherwise; of all property, whether purchased under contract or in open market, when payment therefor is made through this office and the Treasury Department; of all accounts paid through the office and the Treasury; record, in detail, of all advances to disbursing officers, showing the appropriation from and the objects for which the

funds are remitted, together with the amounts thereof; register of letters received for action by the division, and of all correspondence emanating from it.

The manner of accounting by disbursing officers for funds advanced, and by agents for property purchased by or shipped and transferred to them, will be found under the title-head of "Accounts," wherein are described in detail the methods of payments for services rendered and articles purchased, and of issuing and disposing of goods, supplies, &c.

DIVISION OF ACCOUNTS.

This division has charge of all cash and property accounts of Indian agents and other disbursing officers of the Indian Bureau, and examines and audits the same preparatory to the final settlement by the accounting officers of the Treasury; determines all questions relative to the quantities and distribution of supplies, and has supervision over all employés at the agencies, including Indian police.

The plan or system pursued to secure a proper accounting from the agents and officers above alluded to, for public funds and property intrusted to their care, is set forth in detail as follows:

I.—THE CASH ACCOUNTS.

No funds are placed to the credit of any agent or disbursing officer of this bureau (except in the case of Army officers acting as agents) until they have filed a satisfactory bond, ample in amount, and secured on unincumbered real estate in value at least double the amount of the bond. When funds are remitted to an agent, he is furnished with a tabular statement showing the several heads of appropriation to which the funds belong, and instructed as to the purposes to which they may be applied. An account is then opened with him in this office, where he is charged with all funds placed to his credit, under each appropriation, and credited with the several amounts expended, as shown by his accounts, when examined and adjusted by this office. By the tenth section of the act of March 3, 1875 (18 Sts., p. 450), each agent is required to keep a book of itemized receipts and expenditures, and a record of all contracts at each agency, open for inspection at all times, to those properly authorized to inspect the same, and to forward a transcript (see Exhibit A) thereof to the office of the Commissioner of Indian Affairs immediately at the close of each quarter. The records to be kept in this book have been extended by official order to include not only cash transactions, as contemplated in the law, but the receipts, issues, and expenditures of property also, the transcript of which enables the office to sees at a glance what has been done during the past quarter, and when the several transactions took place.

When the agent's regular quarterly accounts are received, if they do not correspond with the detailed statement purporting to have been taken from the book above referred to, it is a proper subject for inquiry and explanation.

The quarterly cash-account of an Indian agent consists of an account current (see Exhibit A) upon which he takes up on the credit side all moneys received from the government or from other sources, and upon the debit side are entered the aggregates of expenditure as shown by the abstracts of disbursements.

These abstracts (see Exhibit B) show the funds on hand and received during the quarter, under each head of appropriation, and the several vouchers of his account are entered thereon in numerical order, and the amount of the voucher carried to the column of appropriation under which it is properly disbursed. The totals of the disbursements under the various heads deducted from the corresponding totals on hand and received, leave the several balances applicable to the succeeding quarter.

In the examination of a cash-account, the "examiner" first ascertains that the agent has taken up thereon all the moneys placed to his credit as shown by the books of this office.

There are two classes of expenditures by agents, viz, payments to employés (see Exhibit C) and for purchases for use of the agency or Indians. In neither of these cases is the agent allowed credit for any but authorized disbursements; no payments to employés for regular or temporary service being allowed, except to those authorized by the Secretary of the Interior, and properly reported on "Reports of employés" (see Exhibit C C), in accordance with section 5 of the act of March 3, 1875 (Stat., vol. 18, p, 449), and approved by this office; no expenditures for purchases being allowed unless said purchases have been authorized by the department. This authority must be previously obtained, except in cases of purchases made under special exigency, a full report of which, clearly establishing the fact that a *bona-fide* emergency existed, must be submitted to the department and approved thereby, before they can be allowed in the agent's accounts. It is not sufficient authority for any expenditure that funds were remitted to an agent for certain general purposes, but he is required to submit itemized estimates of all purchases desired, and to obtain specific approval of the same. It will be seen that no expenditure, no matter of what nature or of how small an amount, that is unauthorized can fail of detection and suspension or disallowance, for it is required that each voucher shall state the date of authority, which statement is always verified in this office by the "examiner," so that it is impossible for a single dollar to be expended by the agent without the sanction of the department.

II.—THE PROPERTY ACCOUNTS.

Purchases once made, the agents are held to an equally strict accountability for the property received, whether purchased by themselves or by this office, and they are required to render a "return of property" (see Exhibit D), showing thereon every article received, and the disposition made of the same. This report shows only the aggregate of receipts and disbursements, and for convenience in examining is accompanied by several abstracts showing the transactions in detail, as follows:

Abstract A.—See Exhibit E.

This abstract shows all articles purchased and paid for by the agent, and for which he has issued certified vouchers, to be paid by this office, and is easily verified, so far as the purchases are paid for by him, by the vouchers in his cash-account above referred to; and those for which certified vouchers were issued, by the vouchers, which would be held in this office unsettled, and no payment made thereon, until the purchases had been taken up by him.

Abstract B.—See Exhibit F.

Upon this abstract appear all articles purchased and paid for by this office on certified vouchers or receipts issued by the agent, and which do not appear in the agent's cash-account. This applies to annuity-goods, subsistence and other supplies purchased in open market or contracted for by the office. This abstract is verified by the records of this office, a book being kept in which is entered all property purchased by the office and consigned to each agency, and, as in the case of Abstract A, all property delivered to the agent, and not taken up by him, is charged against him in the adjustment of his account.

Abstract C.—See Exhibit G.

This abstract is an exhibit of all articles manufactured or produced in any manner at the agency, all increase of agency stock, and, in short, any property that may have come into the agent's hands from any outside source during the quarter. Not only is the agent required to certify to the correctness of this report, but it must also be sustained by the certificate of each and every employé, that it is a true exhibit of the receipts so far as relates to his branch of the service.

Abstract D.—See Exhibit H.

This abstract shows all property issued to Indians. The law requires that issues shall be made to heads of families and not to tribes or bands, and the office requires the receipt of each head of family, or individual Indian not the head of a family, to be taken for the articles issued to them; and the issues, and the signing of the receipts, to be certified to by the interpreter and, at least, two disinterested witnesses. In order to carry out this plan, three forms of vouchers are furnished agents, numbered 1, 2, and 3; any one or all of them may be used at an agency as circumstances require. These vouchers show in detail exactly what is issued to, and received by, each head of family or individual Indian. Voucher 1 is for occasional issues of annuity goods and articles furnished the Indian service, and is used principally at those agencies where no regular issues are made, but supplies, &c., are given to aged, sick, and helpless Indians. Voucher is 2 used at those agencies where, by treaty stipulations, the annuities are issued annually, in one issue, and where it is provided that the issue shall be witnessed by a military officer detailed for the purpose, whose certificate also appears on the voucher, in addition to the other witnesses, and whose report in the case is filed in the agent's accounts. Voucher 3 is for the regular weekly issues of supplies in accordance with the established ration, and is to be complete in all respects as indicated in the certificates printed upon each voucher.

A census is taken at each agency at the beginning of each fiscal year, and, to save clerical labor, the names of the Indians are printed upon voucher 3, the one used for weekly issues. Changes, as they occur, are added in writing by the agent, and new lists are printed when the changes render it necessary. No vouchers are accepted unless they fully meet the requirements indicated in the form, and in the certificates thereon. The totals of each issue are brought to Abstract D. The vouchers are made in triplicate, and immediately at the close of the issue (weekly or otherwise) one copy is forwarded to this office, thus removing any chance for manipulation of these receipts for any purpose whatever, upon making up the quarterly returns. There is also furnished to agents an "Issue-book" to be kept at the agency, open for inspection at all times, to contain a detailed record of each and every issue. (See Exhibit H H.)

At all agencies where subsistence is regularly issued, the agent is required to furnish weekly supply reports showing the quantity of each article on hand at beginning of week, the quantity received and issued during week, and the balance remaining at the close. These reports are recorded in a book for the purpose kept in this office, and as the number of rations and the number of Indians to whom issues were made must appear, any overissue or other irregularity is at once noted and explanation required.

Abstract E.—See Exhibit J.

This abstract shows the quantities of subsistence sold to employés, and the value of the same. No rations are issued to employés, but at agencies where subsistence is furnished by the government for the Indians, each employé is sold and must pay the agent for at least one ration, and permission is given to sell a sufficient quantity of the articles comprising the ration to employés for the subsistence of their families, at the contract price, adding cost of transportation. The quantities sold are brought to this abstract, and the aggregate of moneys received is carried to the agent's cash-account, as proceeds of sales of subsistence to employés. This abstract is a check upon itself, as the value of the property sold and the amount of money taken up by the agent must of course agree.

Abstract F.—See Exhibit K.

This abstract shows all articles expended, worn out, &c., at the agency, and it must be sustained by certificates showing opposite each article the manner in which it was disposed of, and, for everything except his own office property, stationery, &c., the agent is required to furnish the certificate of each employé under whose immediate supervision the articles were expended, as to the correctness of the same.

In addition to the foregoing, agents are required to furnish affidavits of one or more disinterested parties in explanation of all loss of stock or other property lost or destroyed, by accident or otherwise, and that such loss was occasioned by no lack of care on the part of the agent or his assistants.

A *return of medical property* is also furnished. (See Exhibit K K.)

As will be seen by the foregoing, a complete chain of evidence is established and required for all money or property received from the time it comes into the hands of the agent until regularly and finally disposed of; and this evidence is not only that of the agent, but also includes all other evidence that is obtainable upon the reservation.

It is often asserted that no set of papers furnishes a complete check to fraudulent transactions, and that they can always be so used as to mislead the accounting officers in the settlement of an account; but it is believed that those now composing the cash and property accounts of an Indian agent are as full and complete as any that have yet been devised. Under the system now in operation, the possibility of perpetrating frauds upon the government or the Indians, and continuing to do so for any length of time, is reduced to the minimum. With the books required to be kept always open to inspection at the agency, and the books kept at this office, with the number and variety of reports, other than the quarterly accounts required to be rendered, all of which have more or less bearing upon the accounts, and which go to the "examiner" for consideration in connection with them, fraudulent practices are certain to be brought to light unless there be perjury by the agent, false statements by each and every person whose name appears upon the papers, collusion between the agent and all of his employés and with the United States Indian inspector (who may visit the agency at any time), and gross negligence or collusion upon the part of the Indian Office in Washington.

There are seventy-four agents, each rendering quarterly cash and property accounts. These are required to be forwarded within thirty days after the expiration of the quarter.

When received they are registered and receipt acknowledged to agent, and the Second Auditor of the Treasury advised of their reception. They are taken up for examination in the order in which received.

There are at present seven "examiners" employed upon the examination of accounts. The examination is carefully and thoroughly made, each item of expenditure of cash or property being closely scanned to ascertain if in accordance with law and regulations of the department. If not so found, a suspension or disallowance of the amount involved is noted, and upon completing the examination these "remarks" are signed by the "examiner" and the examination submitted to the Commissioner for approval. When approved an accurate record of the examination is entered upon the books of the division, and a copy of the suspensions and disallowances immediately sent to the agent for such explanation as he may desire to make, or for such additional evidence as he may wish to present. The accounts are now passed to the Board of Indian Commissioners for supervision and action as

required by law, after which the board transmits them to the department, the action of the Secretary of the Interior completing the administrative examination. The accounts are then returned to this office by the department, and a further record is made of the action of the board and the Secretary. The amounts expended from each appropriation, as shown by the accounts, are now credited to the agent upon the books of the office by the bookkeeper of this division and the accounts forwarded to the accounting officers of the Treasury for final settlement.

The accounts of special agents at large, inspectors, and other disbursing officers, take the same course as above described. (See Exhibit L.)

In making examinations "examiners" are governed by the "Instructions to superintendents and Indian agents" of July 1, 1877 (now being revised), and the established rule to be followed is that all transactions embraced in the accounts of agents must be supported by the highest obtainable evidence.

III.—AGENCY EMPLOYÉS.

Section 5 of the act of March 3, 1875 (U. S. Stats., vol. 18, p. 449), provides that the number and kind of employés at Indian agencies shall be prescribed by the Secretary of the Interior, and none others shall be employed, and fixes the limit to be paid for salaries of employés at any one agency at $6,000, except by special authority the amount may be increased to $10,000. This division supervises and controls all matters relating to employés, submits all questions pertaining thereto to the department for the authority required by law, and keeps a complete and accurate record, in a book for the purpose, of the entire force, notes all changes as they occur, and conducts all correspondence in connection therewith.

The appointments of Indian police authorized by Indian appropriation act for the fiscal year 1879, approved May 27, 1878, are also supervised and a record kept of them in this division.

It is the policy of the department to enforce regular labor among Indians, in accordance with section 3 of the act of March 3, 1875 (U. S. Stats., vol. 18, p. 449), and to control this matter by withholding luxuries, such as coffee, tea, sugar, and tobacco, from those who will not labor, and increasing in some measure the quantities to those who by labor render themselves worthy of them. The scope of this plan is clearly set forth in office circulars of March 1 and 25, 1878 (see Exhibit M), and its direction has, to a considerable extent, increased the work of this division.

All correspondence pertaining to the accountability of agents for public funds and property placed in their hands is conducted in this division and a permanent record thereof kept in a book for the purpose.

THE LAND DIVISION.

This division has charge of all the Indian lands in the United States, and is the law division of the office.

LANDS.

The number of existing Indian reservations is 143, embracing an aggregate area in round numbers of 151,000,000 acres. They are found within the limits of twelve States and nine Territories, and are located, some of them, in the midst of cultivated communities and surrounded by the highest types of civilization, others beyond the confines of enlightened society and remote from any correct moral influence.

Indian reservations are created and their boundaries defined in four different modes:

1st. By treaties, conventions, and agreements with the various tribes.

2d. By acts of Congress.

3d. By executive orders.

4th. By order of the Secretary of the Interior.

The treaties, conventions, and agreements relating to Indian lands concluded since the adoption of the Federal Constitution number 652, under all of which questions arise, with more or less frequency, for determination here.

The public and private acts and joint resolutions of Congress creating, recognizing, defining, modifying, regulating, disposing of, or otherwise affecting Indian lands number 230, to a large proportion of which occasional and in many cases frequent reference is necessary to determine the rights and claims inuring under them.

The number of executive orders, signed by the President in all cases, which have been issued creating Indian reservations, defining their boundaries, decreasing their areas, or restoring lands so reserved to the public domain, is about 150, all of which were prepared in this division, forwarded to the Secretary of the Interior, with reports showing the necessity or expediency of such action, returned after signature, and kept upon the files of the division.

There is but one regularly recognized Indian reservation which owes its existence solely to an order of the Secretary of the Interior, that of the Chehalis in Washington Territory.

The tenure of Indian lands is a matter of daily importance in the proper discharge of the duties of the office.

The title of the Cherokees, and some other civilized tribes in the Indian Territory, is a base or qualified fee, determinable upon the extinction of the respective tribe, or permanent abandonment of the reservation.

The Senecas, Onondagas, Cayugas, and certain other fragments of tribal organizations in New York hold by similar tenures.

The title of Indians upon ordinary treaty reservations is a tenancy for life, with the rights and incidents appertaining to such tenure; while upon reservations created by act of Congress such title depends mainly upon the terms of the act itself.

The occupants of reservations created by executive order, or by direction of the Secretary, are mere tenants at will, and possess no permanent right to the lands upon which they are temporarily permitted to remain.

The consideration of these diverse tenures, the rights, claims, and controversies growing out of them, and the varied action required thereby, all devolve upon this division.

To the Cherokees, and certain other civilized tribes, patents have issued in the names of the respective tribal organizations, with the qualifications and restrictions to which reference has already been made. These patented reservations, however, are still under the constant supervision of the office, and present numerous, highly important, and exceedingly difficult questions for decision.

Railway companies have received grants of right of way through them, and have used timber, stone, and other material, in the construction of their lines. Rights and claims to compensation therefor, and to damages, direct and consequential, resulting from the opening up of these great thoroughfares of travel and commerce, have arisen, and are constantly presenting themselves for consideration and determination by this bureau.

By treaties and agreements with some of the civilized tribes the government has reserved the right to locate other peaceable Indians upon portions of their immense reservations.

Preliminary to such locations the lands to be used for that purpose are segregated from the others, appraised, and their transfer to such new use effected by, or under instructions from, this division. Its action in this regard has extended to areas, so segregated and appraised, which aggregate several million acres. The quasi-independent and semi-sovereign status of the civilized tribes render their proper management more difficult than in the case of Indians upon ordinary treaty-reservations. They sometimes claim and attempt to exercise the jurisdiction of authoritatively and finally determining questions of citizenship and expatriation among themselves, which are of the very essence of sovereignty and involve its highest prerogatives. Their legal relations as tribes and subordinate nationalities forbid the possession of the powers so claimed, and a wise public policy must absolutely prohibit them as promotive of internal discord and injustice, destructive of the principle of subordination to the authority of the United States, and violative of rights and privileges sacredly guaranteed in treaties with the Federal Government. The restriction of the unwarranted powers thus asserted, and the determination, under treaties, laws, judicial and executive decisions and rulings, and general fundamental principles, of all the questions and controversies so arising, necessarily belong here.

The advancement of any people in civilization, with its accompanying complex business relations and new problems in social life, enhances the importance and increases the difficulty of a just and proper appreciation and administration of the general legal principles applicable from time to time to its progressively changing condition.

As the Indian tribes, abandoning their primitive condition, assume the habiliments, adopt the customs, and claim the privileges of a higher civilization, the problems presented by this new order of things become not only more difficult of determination, but place themselves outside the domain of precedent, and require distinct, independent, and original decision and action.

The Indians belonging to the tribes denominated "civilized" are in this transition state, and they, with others following in their footsteps, require from this office a control and jurisdiction the details of which can follow no precedent because none exists.

The varying titles of Indians upon the different classes of reservations present questions of almost daily recurrence which require prompt decision and speedy action here.

As heretofore stated, bands of Indians upon ordinary treaty-reservations hold their lands by a tenure equivalent in legal effect to a tenancy for life. They are not permitted to cut timber for sale or speculation, but only for fuel, building and fencing purposes, or to clear forest-land for cultivation. Of the timber cut solely for the last-named purpose, they may sell such surplus as may not be required for use upon the premises.

Indians living upon reservations have, in general, the right to cut hay for the use of their live stock, but are invested with no proprietorship in such spontaneous products of the soil as will authorize them to charge and receive compensation for hay cut and used

by white persons thereto duly empowered by the Government of the United States. The same rule is equally applicable to timber upon Indian reservations.

The military, when stationed at a post within an Indian reservation, have the right to cut and use timber and hay to an amount sufficient for their necessities, without liability to make payment therefor to the Indians, or to any person in their behalf.

No persons except Indians, officers of the Indian service, and the military are authorized to cut timber or hay upon such reservations, and the rights in that regard of said excepted classes are carefully limited and restricted as stated above.

All other individuals who cut, or attempt to cut, timber or hay upon these reservations are intruders and criminals, subject not only to apprehension and removal and to punishment for returning, but to fine and imprisoment for the trespasses in question, which are treated as misdemeanors under the law.

Neither the Indians nor any other persons have in general any right to open mines or quarry stone upon reservations, except perhaps in a few cases where the object may be to secure stone for building purposes, coal for fuel, and petroleum for light.

A very cursory glance at the varied and sometimes antagonistic rights, interests, obligations, and duties just stated will suffice to show the difficulties to be surmounted in determining, harmonizing, asserting, and enforcing them, all of which must be done by or under the direction of this division.

Under the provisions of various treaties, Indians of different tribes have the right to make selections of tracts of land of varying areas, in accordance with established rules and prescribed instructions, to receive certificates of allotment, and finally, upon most of the reservations, patents in fee-simple therefor.

The preliminary investigation and decision of the legal status, as regards rights to allotments, of each reservation, the instructions under which selections and allotments are made, the preparation of lists and documents upon which patents are issued by the General Land Office, the transmission and delivery of such patents, and the determination of all controversies and conflicting claims in regard thereto, all belong here.

In the majority of cases such patents do not carry with them an unrestricted power of alienation, but require the consent and approval of the Secretary of the Interior to any transfer or conveyance of such lands.

This approval is based upon his satisfaction with the fairness of the transaction, the adequacy of the consideration, the expediency of the sale, or the competency of the grantor to decide that question, all of which facts must be shown by papers, documents, and certificates from the proper parties duly authenticated, and free from fraud or suspicious surroundings. All this is done under certain prescribed regulations, varying with the different tribes. The preparation of these regulations, the examination of the deeds or conveyances executed thereunder, the rejection of such of them as fail to conform thereto, the recommendation to the Secretary of the Interior for approval of such as appear regular and free from objection, the record and transmission of the approved deeds, and the entire correspondence relative to the whole subject, pertain exclusively to this division.

Under many treaties lands are reserved or granted to individuals by name, with the right to receive patents therefor. All questions and duties in reference to such reservations and grants, except the issue of patents, are determined and performed here.

By act of Congress, approved March 3, 1875 (18 Stats., p. 420), Indians who have abandoned or may hereafter abandon their tribal relations are authorized to enter homesteads and receive patents for the lands so entered, with a restriction upon the power of alienation. The greater part of the responsibility and much of the labor arising from this class of cases devolve upon this bureau.

Many extensive reservations are ceded to the government by Indians in trust that they shall be sold and the proceeds applied to the benefit of such Indians. In these cases an appraisement of the lands is involved, the instructions for which, the examination of the returns thereof, the recommendations for approval, the record of the immense tracts so appraised, the preparation of copies, and the entire correspondence regarding the same, are all the work of the Land Division.

By virtue of various treaty provisions, half-breeds belonging to different bands of Indians, mainly Chippewas and Sioux, became entitled to scrip in lieu of their right to locate certain lands in place. The investigation of claims to such scrip, the issue thereof to proper claimants, the recording and transmission of the same, all inquiries into alleged abuses and frauds connected therewith, the re-examination of unsatisfactory cases, and the rejection of claims not clearly established, with all duties incidental to the foregoing, belong here.

Every bill originating in either the Senate or House of Representatives which affects in any degree Indian lands, or any claims arising from or connected with them, is referred here for examination and report, and in a large number of cases such bills are prepared in this division in the shape in which they finally become laws.

In many instances, bills of this character which have passed both houses come here

by reference from the President, for report as to the justice or propriety of his approval thereof.

Nearly every treaty, convention, or agreement which has ever been concluded with an Indian tribe, has had relation, in part at least, to lands or claims connected therewith. Consequently, the instructions to commissioners appointed to treat with Indians are, in almost every instance, prepared here, and all correspondence connected therewith conducted by the Land Division.

All questions relating to the selection of reservations, changes of their boundaries, increase or diminution of the areas thereof, discontinuance of the same, removal of Indians from one point to another, and consolidation of the different bands or tribes, belong wholly or partly here, and originate in this division.

It is charged with the custody of duplicate plats, and full field-note records of the immense areas surveyed as Indian reservations, and of complete tract-books showing the subdivisional descriptions of all such surveyed lands, together with the disposition of each tract.

It is also charged with the care and safe-keeping not only of the foregoing, but of all other records, files, diagrams, treaties, documents, or papers of every character or description whatsoever, relating to Indian lands, and with the further responsibility and labor of furnishing exemplifications of such records and files to proper parties for legitimate purposes, and upon due application therefor.

The records in question which are in the custody of this division number several hundred, while the papers found upon its permanent files amount to many thousands. A large proportion of these records and files are of incalculable value, and if lost, destroyed, or mutilated could not be restored or supplied; hence the evident necessity of the utmost care in their safe-keeping.

In addition to the duties and responsibilities heretofore indicated, numerous miscellaneous questions arise constantly, and inquiries are propounded in regard to lands or to rights, claims, or controversies immediately or remotely connected therewith; all of which must be investigated, acted upon, or answered, as the case may require, by the Land Division.

These inquiries come from other bureaus and departments of the government, and from official and private persons, and are so widely varied as to admit of no general classification.

LAW.

The legal duties required of this division are grave, responsible, and manifold, and defy accurate classification. Such of them as relate exclusively to lands or cognate questions have been briefly and partially indicated in the foregoing pages.

Indians occupy an anomalous position in this country. Their tribes are domestic, dependent nations, invested with a few of the attributes of sovereignty, but destitute of all its higher and more important characteristics and powers.

Individual Indians are not citizens of the United States, and not foreigners. They are not within the purview of the federal laws upon the subject of naturalization, and can only be clothed with the privileges and prerogatives of citizenship by treaty or act of Congress. They are sometimes, in individual cases, recognized or adopted by a few of the States as quasi citizens thereof; but even this relation is ignored by the federal government in dealing with them, and they are relegated to the undefined and indefinable legal status indicated above. They cannot sue or be sued under the judiciary act of 1789, and only get into the federal courts as civil litigants in occasional instances by favor of special laws.

Indians in the Indian country are not punishable by any law for crimes committed against the persons or property of each other. These offenses are left to the penalties of tribal usage, which generally involve personal vengeance or pecuniary satisfaction for the wrong committed. Sometimes flagrantly troublesome offenders, who may have been guilty of the gravest crimes, are subjected to the farce of a few weeks' or months' arbitrary imprisonment in an agency guard-house or military fort.

But while the Indian is not punishable for the commission upon his countrymen of any of the higher grades of crimes, the laws relating to forgery, bigamy, and certain other offenses against public justice and morality are expressly extended over him. He may kill an Indian woman without excuse or provocation, and he thereby violates no federal law; but if he marries instead of killing her, having a former wife living, he is subject to arraignment, trial, and punishment by the courts of the United States for bigamy.

A great many things are forbidden to the Indian, the doing of which, though in violation of established legal principles, and of express instructions, cannot be punished criminally nor restrained by civil judicial process, simply for want of courts and a code of laws to meet the case. In these cases there only remains the general supervisory and controlling paternal and police authority of the government to be exercised through the agent or by the military.

White persons are punishable for all offenses committed in the Indian country while

for depredations upon the mails, introduction and sale of liquor, and certain other kindred crimes, all persons found guilty thereof, without regard to race or color, are subject to the penalties of the law.

In some instances Indians are subject to the control and punishment provided by United States statutes, in a few others to the limited jurisdiction of State or Territorial tribunals, and in a great many other cases to no civilized punitive control whatsoever.

Questions of guardianship of minors, or of persons *non compos mentis*, of the settlement of estates of decedents, of the reclamation of property stolen or illegally sold, of remedies for trespass, and of the general assertion and protection of all the rights of Indians, belong to this division, and require almost daily attention.

The authority of agents over whites and Indians upon the reservations under their control, their duties and powers in the adjustment of the rights and protection of the interests of all, and the extent to which any other jurisdiction may intervene in matters claimed to be within the scope of their official duties, are subjects requiring frequent consideration and action here.

All claims for arrearage of pay, bounty, pensions, and bounty-lands, by reason of military service of Indians, are prosecuted for the claimants by this division, and a record of all such claims is kept here, showing each step taken therein, and the final determination thereof by the Pension Office.

No contract with any tribe or with individual Indians not citizens of the United States, for the payment of money or the delivery of anything of value in compensation for services rendered, is valid unless executed in duplicate with certain prescribed requisites and formalities approved by this office and the Department of the Interior, and a copy thereof delivered to each of the contracting parties. This work belongs entirely to this division as far as office action is involved.

In short, every question of law involved in the management of Indians, in their tribal or individual capacities, and regarding their internal or external affairs, or affecting in any manner their legal attitude among themselves, or with reference to the whites, becomes a subject for the determination of the Land Division.

CLERICAL FORCE.

The clerical force of this division consists of a chief, who is charged with the ordinary duties of such an officer, and is also *ex officio* acting law-clerk of the bureau, five other clerks, and one copyist.

The varied nature and complex character of the duties of the division render a strict classification of the work assigned to each clerk impracticable.

Three are engaged upon legal and miscellaneous business, claims, and correspondence; one upon Indian deeds; and one upon the general work of the division, including registering correspondence, examining appraisements, and other classes of duties. The copyist, by means mainly of a type-writer, performs for the division, and in part for the office at large, the duties indicated by the title.

All members of the division are assigned to special work, differing from their ordinary duties, as the pressure of business or the necessities of the service may require.

THE CIVILIZATION DIVISION

Has to do in general with questions pertaining to the advancement of Indians in civilized pursuits; of educational and medical matters; of matters pertaining to depredations committed by Indians, as set forth in department rules and regulations, adopted in compliance with act of Congress approved May 29, 1872; with the appointment of superintendents, agents, and inspectors, the recording of their commissions and bonds, and the issuing to them of instructions; with the supervision of trade with Indians, including the granting of licenses to traders, and recording the same in connection with their bonds.

There are employed in the division five clerks. The chief of the division has a general supervision and assignment of the work, conducts the correspondence of a miscellaneous character relating to questions constantly arising in regard to the conduct of the Indians, their welfare and their progress in civilized pursuits; questions in regard to the interference of the whites with the Indians, or of violations of the intercourse laws; removal and punishment of intruders, discipline of refractory Indians, establishment of new agencies, removal of Indians, special instructions to agents, also to inspectors in regard to investigations, and correspondence involving charges against agents.

EDUCATIONAL.

One clerk has charge of this branch of the business and a portion of that pertaining to the medical branch.

The educational branch has to do with all the Indian schools upon Indian reserva-

tions, the funds of which are disbursed under direction of the Indian Office. These schools (not including those of the five semi-civilized nations—Cherokee, Creek, Choctaw, Chickasaw, and Seminole—and those of the New York agency, which are under the exclusive control of said nations) number 121, of which 45 are boarding and industrial schools and 76 are day schools.

A monthly report is received from each of these schools, showing the attendance and status of the pupils and the condition of the school, which is registered and tabulated in a book prepared for the purpose. Many of the boarding-schools are carried on under contracts, which necessitates the proper preparation and revision of the contracts, and all involved correspondence between the Indian Office and the agents and religious bodies to whom the educational and religious work of the respective agencies is assigned in reference to the appointments of proper teachers, the supplies of books and school-furniture, and the best means of promoting the efficieney of the schools. The reports from the New York schools are made quarterly, and are also tabulated. The schools of the five nations in the Indian Territory make annual reports, which are printed with the report of the Commissioner of Indian Affairs.

The medical branch is charged with the examination of the monthly sanitary reports, which are furnished from all agencies where agency physicians are employed or where the agent himself acts as such, and takes such action thereon as may be called for by the facts presented. It revises and corrects the annual estimates of medicines required at the various agencies and prepares all necessary blanks and paper for the annual purchases of medical supplies. It also provides all such supplies as the exigeney of each agency may require at other times. In addition to the above, it examines the monthly reports of agents and conducts the correspondence which may be necessitated by their contents.

As these reports are intended to convey a current history of the agency, they are often voluminous, and the information contained in them is of importance to the service and requires careful consideration.

TRADERS OR LICENSES TO TRADE.

This branch of the business involves much correspondence and occupies a large portion of the time of the clerk who now has it in charge. The number of traders licensed at all the agencies is one hundred and twenty-five. Licenses to trade with the Indians are granted by the Commissioner of Indian Affairs, under the act of Congress, approved August 16, 1876, giving him sole power and authority to grant such licenses; they are granted only to citizens of the United States, of unexceptionable character, and who are fit persons to be in the Indian country. They are not granted to any person who may previously have had a license which was revoked, or the forfeiture of whose bond has been decreed in consequence of the violation of any law or regulation, or who is an improper person to be in the Indian country. Care is also taken in the manner of making applications for licenses; they must either be made in writing to the agent in charge of the Indians for whom the trade is desired, and by him be immediately forwarded to the Office of Indian Affairs, or the application must be made direct to the Commissioner of Indian Affairs. The particular place at which it is proposed to carry on the trade must be designated; and the amount of capital to be employed, the name of the agent, the names of all clerks or other persons to be employed in connection therewith, and the capacity in which each is to be employed must be stated in the application. The application must also be accompanied by satisfactory testimonials of the unexceptionable character and fitness of the applicant, and his proposed employés, if they be not known to the Commissioner. All applications for the renewal of a license are required to be made at least thirty days prior to the expiration of the existing license.

No trade is permitted with any other tribe or tribes at any other place or places than are specified in the license.

The trade with the Indians is required to be for cash only—the use of tokens or tickets prohibited. Agents are also instructed to require traders to furnish price-lists of all the principal articles proposed to be kept for sale to the Indians; said lists to be posted up in conspicuous places and a copy furnished the office and the office promptly notified of any cases in which Indians are charged higher prices than whites for similar articles.

A bond is required to be furnished by the person or persons licensed that they will faithfully observe all the laws and regulations made for the government of trade and intercourse with the Indian tribes, and in no respect violate the same, in the penal sum of $10,000.

The principals of all trading establishments in the Indian country are held responsible for the conduct and acts of their employés, and any infraction of the terms or conditions of a license is considered good and sufficient reason for revoking it, in the same manner as if committed by the principals themselves. No Indian agent or other person employed in the Indian service is permitted to have any interest, directly, or

indirectly, in the trade carried on by any licensed trader at his agency. Where application is made to sell ammunition, the same is forwarded to the War Department under a regulation adopted by this office during the past year. No permission is granted for the sale of ammunition by the Interior Department.

A record is made of the bonds and licenses of traders by the clerk who has charge of this branch of work, and he also conducts the correspondence which has reference to the license business.

APPOINTMENT OF AGENTS, ETC.

There are in the service seventy-four agents, three inspectors, and two special agents at large. These agents and inspectors are all required to give bonds, which vary in sums from five thousand to fifty thousand dollars. The several sums in which their sureties justify must in all cases aggregate at least double the penalty of the bond and be properly authenticated. One clerk has charge of the business of examining and transmitting these bonds to the Secretary for approval; of recording them after their approval, and transmitting them to the Second Comptroller of the Treasury; of recording and issuing commissions and issuing general instructions to agents. He also makes a record of all letters assigned to the division and a record of all claims on account of depredations; conducts the correspondence with the agents relative to their appointments, and also with the Interior and Treasury Departments in regard to the same; has charge of agents' monthly reports, examining same and transmitting to the different divisions having charge of the particular business to which they may relate; keeps the roster of agents, inspectors, &c., and transacts such miscellaneous and special work as is required of him.

CLAIMS ON ACCOUNT OF DEPREDATIONS.

This business is transacted in the Civilization Division, and embraces all claims for depredations committed by Indians against whites and by whites against Indians, where provision is made for the latter by treaty stipulations. A record is kept of all these claims, and the rules adopted by the department under the act of Congress, May 29, 1872, require a thorough examination of such claims by the agent of the Indians charged with having committed the depredation, their submission to the Indians in council, and transmission to the office, accompanied with his report. They are then examined and a report made thereon to the Secretary, and are transmitted by him to Congress. The claims of this character presented to the office since 1864 amount, in the aggregate, to over $6,000,000. The work pertaining to this branch is now performed by the chief of the division and the clerk who has charge of appointments of agents, records of the division, &c.

The copyist, or fifth clerk, makes copies from the original transcripts, of all letters, reports, and miscellaneous matters which are sent out from the division.

DIVISION OF RECORDS AND FILES.

1st. This division, as its title implies, has custody of all permanent records and files, with the exception of those pertaining to the "Land Division" of the bureau.

2d. The records consist of yearly "Report Books," in which are recorded in permanent form all reports to the honorable the Secretary of the Interior.

3d. Yearly "Letter Books," of three classes, viz, Miscellaneous, Finance, and Accounts, in which is recorded all outgoing correspondence of every nature pertaining to the business of the Office of Indian Affairs.

4th. "Register of Letters Received," kept by the quarter, in which all incoming correspondence, except claims, after being briefed, jacketed, if necessary, and stamped, is registered by abstract, in alphabetical order, and according to date of receipt, the name of the writer being the guide, with proper file-marks on margin of register, said file-marks duplicated on each paper and inclosure to identify them for the future in their ramification through, and final disposition by, the office.

For convenience and rapidity of reference a system of double notations, in red ink, is kept up throughout this book in all important cases. Hence it will be observed that the clerk in charge thereof receives and distributes to the respective divisions of the office all incoming correspondence.

Upon the return of each paper, after final action has been had thereon by the division to which it was referred, said action is entered opposite the original entry on this register, and the paper then placed in its proper file, thus presenting in concise form a complete history in brief of each and every paper or document received.

5th. "Record of Claims and Contracts," in which abstract entry is made of all claims and contracts except those on account of depredations by whites or Indians (which latter are entered upon the "Register of Letters Received," and sent to and acted upon by the Civilization Division). Upon the return of all papers pertaining to claims, having been acted upon by the division to which they were referred, said action is entered opposite the original entry in the "Claims Book," and they are ready for the

files, thus again presenting in concise form a complete history in brief of that class of papers.

6th. Yearly "Abstract of Letters Sent," in which are kept abstracts of all outgoing correspondence, with proper notations of date, from what division, to whom, subject, and finally the number of record or letter-book, and page, within and upon which each and every letter can be found recorded in full. The system of keeping this book is by "file-mark," running from "Annuity," the first, to "Wyoming," the last. This book is a complete and clear index of all letters sent. The importance of the three foregoing registers as mediums for constant and quick reference, for the information of every division of the office, in the transaction of the business thereof with celerity and dispatch, cannot be overestimated.

7th. *Arrangement of the files.*—The files are arranged in file-boxes, properly marked with the names of agencies, superintendencies, and localities, by dates, and these file-marks agree in every particular with those referred to in the registers hereinbefore mentioned. They are placed alphabetically, and the papers within alphabetically and numerically arranged. It is impossible that access can be had thereto except by those duly authorized, and in every instance where a paper or document is withdrawn therefrom the clerk charges himself with it by leaving a slip in lieu thereof in the file-box. This same rule applies to the record and letter books.

8th. The clerical force consists of six men:

1. The chief of the division has charge of the "Register of Letters Received," and exercises general supervision.
2. Clerk in charge of "Abstract of Letters Sent."
3. Clerk in charge of "Claims Book."
4. Clerk in charge of "Report Book," containing reports to the Secretary.
5. Clerk in charge of "Miscellaneous Letter Book," containing record of all letters except reports to the Secretary written by the Land and Civilization Divisions; and, lastly—
6. Clerk in charge of briefing.

THE WORK OF THE PURCHASING COMMITTEE OF THE BOARD OF INDIAN COMMISSIONERS.

As showing the methods pursued by the Board of Indian Commissioners in the conduct of that branch of Indian business of which they have special oversight, it may not be out of place to insert here a report received from the chairman of the purchasing committee of the board:

NEW YORK CITY, *September* 16, 1878.

SIR: The department of the Indian service which the Board of Indian Commissioners has assigned to the supervision of its purchasing committee may be appropriately designated as the mercantile department, demanding in its administration sound mercantile judgment and thorough mercantile experience, with a familiar acquaintance with the best markets for manufactured goods, agricultural implements and products, and every description of article required for the maintenance, education, and elevation of the Indian tribes, a large portion of which are furnished in fulfillment of treaty stipulations.

To those unacquainted with the details of this service, a study of the following incomplete list of articles purchased upon government requisitions may prove instructive:

Beef on the hoof, 35,000,000 pounds per annum.
Bacon.
Mess beef.
Mess pork.
Lard.
Wagons.
Flour.
Corn.
Oats.
Hay.
Hominy.
Harness.
Saddles and saddlery.
Harness leather.
Harness oil.
Mowing-machines.
Sewing-machines.
Agricultural implements.
Mechanical implements.
Hardware.
Tin ware.
Wooden ware.
Crockery.
Paints and oils.
White lead.
Indigo.
Medical stores.
Surgical instruments.
Cutlery.
School books.
School furniture.
Sugar.
Molasses.
Coffee.
Tea.
Tobacco.
Rice.
Baking-powders.
Hard bread.
Groceries (general).
Soap.
Beans.
Blankets.
Clothing.
Boots and shoes.
Hats and caps.
Dry goods (general)
Notions.
Shirts.
Woolen yarn.

At the letting of contracts in June last more than three hundred and fifty proposals were received for the foregoing articles and transportation, and it has been the aim of the Commissioner of Indian Affairs and the Board of Indian Commissioners, in awarding contracts, to secure the best values offered, a faithful delivery of identical value by the contracting party, a careful distribution to the several agencies, and safe transport thither, reserving original samples, so far as practicable for verification if required.

An active participation in these transactions during four years justifies the confident belief that the present methods of administration in this branch of government service are eminently suited to the protection and security of the best interests of the government and the Indians, and that for general fidelity, integrity, or efficiency the mercantile department of the Indian Bureau cannot suffer by comparison with any other branch of public service.

Very respectfully,

E. M. KINGSLEY,
Chairman Purchasing Committee,
Board of Indian Commissioners.

REMARKS.

Of late years there have been many and radical changes in the administration of Indian affairs. The present methods of accounting for property and money, and of doing the business generally, are so different from those of former years, that a few comparisons may not be amiss.

Until the fiscal year of 1876 and 1877, each Indian agent had charge of the disbursements of the funds which were appropriated for his agency. At the present time the total disbursements of Indian agents for other purposes than the payments of cash annuities and the salaries of employés do not exceed $100,000.

Formerly almost all the money expended for the Indian service was spent in payment for open-market purchases. Now almost all expenditures are made by payments through the Treasury Department for goods purchased under contracts made by the Commissioner of Indian Affairs.

Formerly agents were the sole judges of the necessities for making purchases. Now they must submit their proposals and estimates and give satisfactory reasons to the Commissioner of Indian Affairs, who, if he approves, must ask the Secretary of the Interior for authority to make the purchases.

Formerly there was nothing to prevent contractors putting in straw bids, or withdrawing after a contract had been awarded to them, in order that a bidder at a higher price (oftentimes the same party under another name) might receive the award. Now bidders are obliged to deposit certified checks upon some national depository for five per cent. upon the amount of the contract to be awarded, which checks will be forfeited if, upon the award being made, the party fails to enter into contract.

Formerly contracts were so drawn that those to whom beef and flour contracts were awarded could and did habitually take advantage of the necessities of the Indians to force agents to accept grades inferior to those called for by the contracts. Now these contracts are so drawn that if a contractor fails to carry out his agreement in good faith he is subjected to a heavy loss.

Formerly agents hired as many employés as they saw fit and paid them such salaries as they chose. Now all employés must be approved by the Secretary of the Interior, and legal limits are fixed to the amounts which may be expended for agency employés.

Formerly agents' accounts ran on for years without settlement. Now their accounts are settled quarterly.

Formerly funds were remitted quarterly to agents, even though their accounts might not have been sent in for two or three years. Now remittances to agents are not made and the salaries of their employés cannot be paid, until their accounts for the preceding quarter have been received in the Indian Office.

Formerly the unexpended balances of funds which remained in the hands of agents at the end of a fiscal year were carried over by them to succeeding years until their retirement from the service. Now balances are covered into the Treasury at the end of each fiscal year.

Formerly agents expended government property in such manner as they thought best. Now sufficient reasons must be given for the disposal of any government property, and authority must be obtained from the Secretary of the Interior before any expenditure can be made.

Formerly supplies issued to Indians by Indian agents were receipted for by the chiefs. Now each head of a family and each individual Indian who is of age must receipt for himself.

Formerly when annuity moneys were paid to Indian tribes in fulfillment of treaty stipulations a large percentage of the whole sum was divided (or supposed to be) among a few prominent chiefs. Now each individual Indian, including chiefs, receives his *per capita* share.

Formerly flour was accepted at an Indian agency without any inspection. Now it is inspected before shipment and again upon its arrival at the agency.

Formerly when beef-cattle were delivered at agencies, two or three head were selected by the contractor's herder and the agent, and by their weights an estimate was made of the weight of the whole herd. Now the agent must render a certified weigher's return for all animals received.

Formerly Indian traders were permitted to charge whatever prices they might elect to put upon their goods. Now their prices are controlled by the Indian Office.

Formerly a trader might charge an Indian two or three times the price charged a white man for the same kinds of goods. Now traders are forbidden to make any distinction in prices, under pain of the forfeiture of their licenses.

Formerly the Indians were imposed upon through a system of brass checks, tokens, and store-tickets. Now traders are forbidden to use anything but money.

Formerly contracts were made with Indians for collecting claims against the government, by which attorneys took from one-half to two-thirds of the sums which were collected. Now all contracts made with Indians must be approved by the Commissioner of Indian Affairs and the Secretary of the Interior before attorneys can have any standing in the Indian Office; and, if contracts are approved, attorneys are obliged to show what services they have rendered before any payments can be made.

In the fiscal year 1874 the appropriations for the Indian service amounted to $8,329,815.80, and the actual number of Indians to be cared for by the government was less than at the present time. For the service during the present fiscal year there was but $4,733,875.72 appropriated, and there now are 250,000 Indians to be cared for.

In addition to the three Indian inspectors which were formerly allowed, there are now two special agents connected with the bureau. With this force, and a proper administration of the business, there need be no difficulty in detecting frauds and reforming the service. Time alone is needed.

E. A. HAYT,
Commissioner.

Statement showing the location of agencies, names and salaries of agents, expenses of agencies, &c.

Name of agency.	Location of agency.	Name of agent.	Salary of agent.	Number of Indians.	Pay of interpreters.	Expenses of agency.		
						Pay of employés provided by treaty.	Pay of employés not provided by treaty.	Contingencies.
Abiquiu (to be discontinued)	New Mexico (northern part)	S. A. Russell	$1,200	326	$300		$900 00	$67 75
Blackfeet	Montana (North Missouri River)	John Young	1,800	7,300	300	$6,910 00		1,410 58
Colorado River	Arizona (on Colorado River)	H. R. Mallory	1,500	1,231	300		6,780 00	190 50
Cheyenne and Arapahoe	Indian Territory	John D. Miles	2,300	5,002	600	5,620 00	2,810 00	819 27
Cheyenne River	Dakota (Missouri River)	Theo. Schwan, U. S. A. (acting agent)	1,500	1,953	400	5,680 00		45 50
Crow	Montana (Yellowstone River)	David Kern	2,000	2,200	400	6,560 00	2,480 00	1,227 79
Crow Creek	Dakota (Missouri River)	W. E. Dougherty, U. S. A. (acting agent)	1,300	1,223	300	2,100 00	5,000 00	150 00
Colville	Washington Territory (Columbia River)	John A. Simms	1,500	3,437	300	726 00	3,900 00	47 00
Devil's Lake	Dakota (Northern)	James McLaughlin	1,200	1,105	300	4,420 00		220 80
Flandreau	Dakota (Southeast)	W. H. H. Wasson	1,000	364			600 00	33 75
Fort Berthold	Dakota (Missouri River)	E. H. Alden	1,400	1,263	600		5,860 00	509 05
Fort Hall	Idaho (Southeast)	W. H. Danilson	1,500	1,507	300	4,320 00	680 00	88 05
Fort Peck	Montana (Northeast)	W. Bird	2,000	5,021	600		8,160 00	25 00
Flathead	Montana (Northwest)	Peter Ronan	1,500	1,542	300	8,620 00	300 00	757 53
Great Nemaha	Nebraska (Southeast)	M. B. Kent	1,000	322	600	4,760 00		386 60
Grand Ronde	Oregon (Northwest)	P. B. Sinnott	1,000	739	300		2,800 00	225 33
Green Bay	Wisconsin	J. C. Bridgman	1,500	2,816	300	5,400 00	800 00	816 71
Hoopa Valley	California (Northwest)	R. C. Parker, U. S. A. (acting agent)	1,000	427			3,960 00	
Kiowa and Comanche and Wichita.	Indian Territory	P. B. Hunt	2,000	2,978 1,292	400	3,360 00	5,540 00 7,960 00	119 15 143 05
Klamath	Oregon (Southern)	J. H. Roork	1,100	897	600	8,220 00		133 93
Los Pinos	Colorado (Western)	Joseph B. Abbott	1,600	2,000	500	5,520 00		384 85
Lower Brulé	Dakota (Missouri River)	W. E Dougherty, U. S. A. (acting agent)	1,200	1,188	300		5,360 00	49 00
Lemhi	Idaho (Salmon River)	J. A. Wright	1,100	940			3,500 00	762 60
Leech Lake	Minnesota (Northern)	H. J. King	1,500	2,202	300		3,060 00	334 69
La Pointe	Wisconsin (Lake Superior)	I. L. Maban	2,000	4,630	800	3,720 00	2,960 00	764 98
Moquis Pueblo	Arizona (Northern)	W. R. Mateer	1,300	1,339	300		5,000 00	
Mackinac	Michigan	George W. Lee	1,200	10,056	600	1,200 00	2,025 00	913 66
Mescalero Apache	New Mexico	J. A. Brodhead	1,500	1,400	500		5,200 00	240 00
Malheur	Oregon (Eastern)	W. V. Rinehart	1,000	759	300		5,160 00	545 52
Mission	California	S. S. Lawson	1,300					
Nez Percé	Idaho (Northwestern)	John B. Monteith	1,600	2,800	300	12,180 00	280 00	330 91
Nevada	Nevada (Western)	A. J. Barnes	1,800	1,700	900	1,800 00	4,500 00	484 94
Navajo	New Mexico	J. E. Pyle	2,000	11,868	300		5,440 00	103 48
New York	New York	D. Sherman	1,200	5,041		150 00	411 00	277 66
Neah Bay	Washington Territory (Northwest)	Charles Willoughby	1,100	803	500	4,400 00	800 00	266 09
Nisqually	Washington Territory (Western)	R. H. Milroy	1,200	1,054	500		5,380 00	49 27
Osage and Kaw	Indian Territory	L. I. Miles	1,600	2,391 424	300	8,900 00	4,880 00	1,368 35

Statement showing the location of agencies, names and salaries of agents, expenses of agencies, &c.—Continued.

Name of agency.	Location of agency.	Name of agent.	Salary of agent.	Number of Indians.	Pay of interpreters.	Expenses of agency.		
						Pay of employés provided by treaty.	Pay of employés not provided by treaty.	Contingencies.
Omaha	Nebraska (Missouri River)	Jacob Vore	$1,000	$1,061	$300	$5,963 00	.....	$176 61
Otoe	Nebraska (Southeast)	J. W. Griest	1,000	452	300	4,080 00	.....	347 35
Pima and Maricopa	Arizona (Southern)	J. H. Stout	1,800	4,500	400	.....	$3,840 00	919 00
Papago	do	.....	1,800	6,000	300	.....	600 00	.....
Pottawatomie (Kansas)	Kansas (Northeast)	H. C. Linn	1,000	758	300	5,760 00	.....	276 25
Pawnee	Indian Territory	S. S. Ely	1,200	1,521	300	8,120 00	.....	273 29
Ponca	do	W. H. Whiteman	1,200	717	600	3,900 00	3,900 00	175 00
Pueblo and Cimarron	New Mexico (to be discontinued)	B. M. Thomas	1,500	8,842	$500 500	.....	5,660 00 1,740 00	817 75 90 00
Quapaw	Indian Territory	H. W. Jones	1,200	1,345	300	2,320 00	1,200 00	325 00
Quinaielt	Washington Territory (Western)	Oliver Wood	1,000	311	.....	3,640 00	250 00	77 02
Round Valley	California (Northern)	H. B. Sheldon	1,500	996	.....	.....	7,780 00	341 18
Red Cloud	Dakota	James Irwin	2,200	6,709	600	.....	9,180 00	123 97
Red Lake	Minnesota (Northern)	A. D. Baker	1,500	1,191	300	4,500 00	1,260 00	519 52
San Carlos	Arizona (Southeastern)	H. L. Hart	2,000	4,730	300	.....	10,000 00	1,534 89
Southern Ute	Colorado (Western)	F. H. Weaver	1,200	1,700	300	3,780 00	.....	.....
Spotted Tail	Dakota	W. J. Pollock (special agent)	2,200	8,774	500	9,500 00	.....	33 25
Sisseton	Dakota (Eastern)	E. H. C. Hooper	1,500	1,715	500	8,500 00	.....	450 00
Standing Rock	Dakota (Missouri River)	W. T. Hughes	1,700	2,518	450	9,240 00	.....	274 05
Sac and Fox	Indian Territory	Levi Woodard	1,200	1,383	400	6,920 00	1,980 00	400 00
Sac and Fox	Iowa	Thomas S. Free	1,000	341	100	600 00	.....	100 00
Santee	Nebraska (Northeastern)	Isaiah Lightner	1,000	744	300	3,300 00	720 00	126 37
Siletz	Oregon (Northwestern)	William Bagley	1,200	1,085	300	.....	7,960 00	210 60
Skokomish	Washington Territory	Edwin Eells	1,100	800	300	4,320 00	720 00	300 67
Shoshone	Wyoming	James I. Patten	1,500	1,800	300	6,900 00	800 00	293 91
Tule River	California	C. G. Belknap	1,000	254	...	.....	2,520 00	102 61
Tulalip	Washington Territory	Alfred N. Marion	1,500	2,900	500	5,340 00	900 00	603 19
Umatilla	Oregon	N. A. Cornoyer	1,200	849	300	7,380 00	.....	325 35
Uintah Valley	Utah	J. J. Critchlow	1,000	639	300	.....	4,100 00	468 06
White River	Colorado	N. G. Meeker	1,200	900	300	4,950 00	.....	283 81
White Earth	Minnesota	C. A. Ruppee	1,600	2,894	300	2,280 00	2,380 00	113 97
Winnebago	Nebraska	Howard White	1,200	1,410	300	9,480 00	.....	277 28
Western Shoshone	Nevada	John How	1,800	3,600	.....	.....	1,200 00	.....
Warm Springs	Oregon	John Smith	1,000	508	300	4,100 00	.....	223 01
Yankton	Dakota (Missouri River)	J. W. Douglas	1,600	2,182	300	8,160 00	.....	204 80
Yakama	Washington Territory	J. H. Wilbur	2,000	3,650	300	11,180 00	.....	167 67
Gros Ventres	Montana	W. L. Lincoln	1,000	2,793	.....	.....	900 00	.....

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, and lands held by them, and their status and prospects as respects civilization.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty per annum.	Status and prospects of Indian tribes.
ARIZONA.			
Colorado River agency.			
911 Mojaves 320 Chemehuevas 620 Hualapais	128,000		Only the Mojaves are on the reservation proper. The Hualapais are roaming Indians in Northwestern Arizona. The Chemehuevas cultivate land set apart by executive order on the west bank of the Colorado river, and gain a precarious support, dependent on the overflow of the river. The Mojaves must depend on government rations for subsistence until irrigating facilities are provided by the completion of the irrigating ditch. The Hualapais are troublesome. The others are friendly and tractable, though they have never made a treaty with the United States, and have only a moral claim for appropriation.
Pima and Maricopa agency.			
4,100 Pimas 400 Maricopas	64,995		All are industrious and peaceable farmers, and need only schools, a few employés, and assistance in retaining possession of lands susceptible of irrigation. No funds are due them under treaty.
6,000 Papagos	8,000		
San Carlos agency.			
4,400 Apaches	2,528,000		Have made little progress in civilization beyond submission to the government, maintained by a most effective system of Indian police. Are entirely dependent on the government for subsistence, which is due them in accordance with promises made by civil and military officers to induce them to go and stay upon a reservation.
Not under an agency.			
900 Yumas 700 Mojaves			The former are wandering Indians in the neighborhood of Fort Yuma, and the latter roam around Fort Mojave; show no hostility, and should go to the Colorado River Reservation as soon as irrigating facilities are provided. Have no lands or funds.
CALIFORNIA.			
Hoopa Valley agency.			
427 Hoopas	89,572		Are peaceable, indolent, demoralized Indians, degraded by contact with whites. Not one-tenth of the reserve is suited to agriculture.
Mission Indian agency.			
Mission Indians, 4,400	60,000		Are industrious, law-abiding, and self-supporting whenever they are allowed by whites to remain on the lands which they have cultivated for generations. They differ from other farmers in California, principally in having no rights which citizens are bound to respect. Their only need is more land.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
Round Valley agency.			
1,000 Potter Valley, Pitt River, Redwood, Wylackie, Concord, and Little Lake Indians.	207,360	.....	Have schools, churches, houses, farms, &c.; are the laboring class of that part of California, and are making steady advance in civilization. Only 5,000 acres of the reserve is arable land.
Tule River agency.			
254 Tules and Tejons	91,837	.....	Most of the reserve is mountainous and barren. The Indians wear citizens' dress, are building houses and opening farms on the new reserve to which they moved last year, and are doing as well as could be expected.
Not under an agency.			
250 King's River Indians 16 Kahweaks 1,125 Klamaths 650 Indians of various tribes.....	.....	.....	The Klamaths are scattered along Klamath River, living in primitive style, undisturbed by settlers, on lands which once formed a reservation. The remainder are scattered among white settlements, and are about evenly divided between industrious laborers and annoying vagrants.
COLORADO.			
Los Pinos agency. 2,000 Utes..... *White River agency.* 900 Utes ..... *Southern Ute agency.* 1,200 Utes.....	11,724,800	Employés or schools, $8,200, indefinite; clothing, &c., $30,000, for 21 years; subsistence, $30,000, indefinite; civilization, $25,000, forever.	The Utes are all on one reserve under three agencies; they are nearly all wild blanket Indians, who have always been friends of the whites, as a tribe. Abundance of game has thus far relieved them from the necessity of undertaking civilized labor, though a few families have made a beginning, and all fully realize that they must come to it in a few years.
DAKOTA.			
Cheyenne River agency. 1,958 Sioux..... *Crow Creek agency.* 1,223 Sioux.....			Under the agreement of September 26, 1876, the Sioux are to be subsisted by the government until they have a fair chance to subsist themselves. The attempts made at the various agencies to induce them to labor have shown both the will-

Lower Brulé agency.			ingness of the Indian (with proper inducements) and the discouragements which he must constantly meet in the climate and soil of his reserve. They understand fully that the agreement insists on their returning a labor equivalent for their rations as fast as they are furnished means to do so, and on their sending their children to schools, so far as schools are provided. The boarding-schools at Crow Creek, Cheyenne River, and Standing Rock, are full, and could Congress be induced to appropriate enough to provide school accommodations for all children, as required by the treaty of 1868, the advance of the tribe in civilization would be continuous and satisfactory. The removal now in progress, of the Spotted Tail and Red Cloud Sioux to a good location on their reserve, gives the first opportunity for the inauguration of a permament work of civilization among them.
1,188 Sioux	24, 525, 475	Clothing, $159,400, 22 years; civilization, $200,000, 22 years; employés, or schools, $12,400, indefinite; subsistence, $1,100,000, indefinite.	
Red Cloud agency.			
6,035 Sioux			
Spotted Tail agency.			
6,861 Sioux			
Standing Rock agency.			
2,300 Sioux			
Devil's Lake agency.			
1,105 Sisseton and Wahpeton Sioux	230, 400		A flourishing boarding-school has an attendance of 50 pupils. Two-thirds of the Indians wear citizens' dress and live in houses. They obtain half their subsistence by labor in civilized pursuits. They cultivated last year 500 acres, and raised 6,000 bushels of corn and 15,000 bushels of vegetables.
		$80,000 for 5 years	
Sisseton agency.			All wear citizens' dress; nearly all live in houses; lands are allotted in severalty; 1,500 acres are under cultivation; a good boarding-school has 60 pupils; rations are issued only in return for labor performed, and half their subsistence is raised by themselves. Many are about ready for citizenship.
1,715 Sisseton and Wahpeton Sioux	918, 780		
Yankton agency.			The two boarding and nine day schools have gathered in 200 pupils. Nearly all able-bodied Indians work more or less; half the agency employés are Indians. The majority live in houses. Farming and stock-raising gain ground among them each year; 980 acres are cultivated, and 500 head of cattle are owned by the Indians. Their progress in civilization is rapid and constant.
2,182 Yankton Sioux	430, 405	Civilization, $40,000, 1 year; $25,000, 10 years; $15,000, 20 years.	
Fort Berthold agency.			
670 Arickarees 466 Gros Ventres 257 Mandans	8, 320, 000	Civilization, $75,000, indefinite	The Indians are peaceable and have always been so, and are not disinclined to work; but their reservation is worthless, and they are unwilling to move.
IDAHO.			
Lemhi agency.			
940 Bannocks, Shoshones, and Sheep-eaters.	64, 000	Civilization, $20,000, indefinite	Little advance has been made by these Indians. They depend principally on such hunting as they can find without coming into conflict with the Sioux, their enemies, and have shown a readiness to adopt civilization, but have lacked opportunity.
Nez Percé agency.			
1,800 Nez Percé	746, 651	Civilization, $4,000, 2 years. Schools and employés, $17,200, 2 years; $7,600, indefinite; schools, $3,000, 2 years; $2,000, 1 year; repairs, $3,500, 4 years. Salaries chiefs, $8,000.	They are nearly self-supporting, receive no government rations, and, except about 10 per cent., their subsistence is obtained by their own labor in civilized pursuits. Last year's crop was 25,000 bushels wheat and 9,000 bushels corn, oats, and barley. They own 7,000 head of cattle. Two hundred Indians can read. They cultivate 4,200 acres.
600 Pend d'Oreille and Kootenais			Roaming Indians, without an agency, in Northern Idaho.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
Fort Hall agency.			
1,307 Bannocks and Shoshones	1,202,330	$6,446, 22 years; $34,000, 2 years; $5,000, indefinite.	Have made little progress in civilization as a tribe, but 75 families have made a beginning in farming.
INDIAN TERRITORY.			
Cheyenne and Arapahoe agency.			
2,299 Southern Cheyennes 1,766 Southern Arapahoes	4,297,771	Civilization, $20,000, 20 years. Employés, $9,700, indefinite. Clothing, $14,500, indefinite. Agriculture, $2,500, 2 years.	The Northern Cheyennes removed from Dakota to the Indian Territory last year, after taking prominent part as "hostiles" in the Sioux war. Since arriving there they have made no disturbance. Since the war of 1874 the Southern Cheyennes and Arapahoes have made great advance in civilization. The boarding-school has 113 children, all that can be crowded into the building. Five hundred families have undertaken civilized labor, the men working with their own hands, and last year they raised 10,000 bushels of corn. For subsistence, however, they are still, in the main, dependent on government rations. Last season they transported all their supplies from the railroad to the agency, the funds which would otherwise have gone to the transportation contractor having been invested in wagons, animals, and harness, which were afterward issued them in return for such labor. They are still blanket, tepee Indians, ready to improve all the advantages in the way of instructors, implements, stock, seeds, &c., which Congress will make it possible for the bureau to furnish.
937 Northern Cheyennes		Clothing, $7,500, 21 years; useful articles, $9,000, 1 year. Employes, $3,700, forever.	
Kiowa and Comanche agency.			
1,090 Kiowas 1,545 Comanches 343 Apaches	2,968,893	Civilization, $30,000, 20 years. Employés, $9,700, indefinite. Clothing, $26,000, indefinite. Agriculture, $2,500, 2 years.	They were also in the war of 1874 (except two-thirds of the Kiowas), and are in about the same condition as the Cheyennes and Arapahoes in regard to schools, farming, &c., but they have not tried the experiments of Indian transportation.
Osage agency.			
2,391 Osages	1,466,167	Education, $3,456, forever. Civilization, $15,000, forever.	They raise about half their subsistence, have lands allotted in severalty, and have 270 children in school, but have not made corresponding progress in renouncing the blanket and tepee. They are cultivating 4,000 acres. Last year raised 4,000 bushels wheat and 75,000 bushels corn.
424 Kaws	100,141	Civilization, $11,525, forever. Osages, civilization, $60,500, forever.	
Pawnee agency.			
1,521 Pawnees	283,026	Annuity, goods, &c., $30,000, forever. Schools, $10,000, indefinite. Employés, $6,180, indefinite.	They are friendly blanket Indians, who removed to the Indian Territory in 1875. They have 93 children in school and are slowly opening farms, &c., and getting established there.
Ponca agency.			
717 Poncas	.....	Civilization, $8,000, 11 years; $10,000, indefinite.	Before leaving Dakota, in 1876, they had houses and farms, and were accustomed to work. They have just gone to their permanent location in the Indian Territory, and have had no time to get established. They have always been the friends of the whites.

Quapaw agency.			
85 Eastern Shawnees 30 Black Bob 235 Senecas 246 Wyandots 70 Ottawas 112 Modocs 235 Quapaws 114 Peonas, &c 60 straggling Pottawatomies	13,048 33,393 51,958 21,406 14,860 4,040 56,685 50,301	Annuity, $701, forever; employés' $2,120, indefinite. Interest, $4,900 forever; $2,720, indefinite; employés, education, $2,660, indefinite; $8,167, forever.	These Indians for the most part live in houses, wear citizens' dress, and support themselves by their own labor. They still need employés and schools. The Quapaws and Modocs, however, are an exception; the former being indolent and demoralized, and the latter have not yet become independent of a small government ration. They are industrious, however, and progressing rapidly toward self-support.
Sac and Fox agency.			
405 Sacs and Foxes 661 Absentee Shawnees 317 Mexican Kickapoos	479,667 575,877	$51,000, forever; $2,764, forever; $5,741, reserve.	The Absentee Shawnees have houses and farms, wear citizens' dress, and are nearly self-supporting. The Sacs and Foxes are more indolent, owing to their large annuity fund. The Kickapoos, who removed from Mexico five years ago, though still clinging to the blanket and wickiup, are becoming interested in farming and stock-raising, and have broken land, fenced farms, and put up hay on their own account, and are beginning to cut house-logs.
Union agency.			
18,672 Cherokees	5,031,351	$145,151	The status of these tribes as the "civilized tribes" of the United States, is well known. Their principal needs are law, and the allotment of their lands in severalty. All of their funds, except $4,710 belonging to the Creeks, are of a permanent character.
16,000 Choctaws	6,688,000	$89,941	
14,000 Creeks	3,215,495	$14,397 $72,678	
5,600 Chickasaws	4,650,935	$70 479	
2,443 Seminoles	200,000	$28,500	
Delawares incorporated with Cherokees		$16,789	
Wichita agency.			
643 Caddoes 150 Comanches 90 Keechies 154 Tawacamis 45 Wacos 210 Wichitas	743,610		These Indians are nearly all engaged in farming, from which they obtain about one-third their subsistence. One great drawback to their civilization is the stealing of their stock by white men. Nearly half are living in houses, for the building of which there is an increasing demand. One hundred and fifteen children are in school.
Not under an agency.			
250 Citizen Pottawatomies			After receiving premature citizenship in Kansas and squandering their share of tribal funds, they have taken refuge again on a reservation in the Indian Territory, and manage to get along without government help except a government school.
IOWA.			
Sac and Fox agency.			
341 Sac and Fox	692	Part of $51,000 credited to Sac and Fox in Indian Territory.	They are on lands purchased by themselves, with their annuity money. All work more or less for themselves or neighboring farmers. Their land is poor, and they are slow to adopt civilized dress and customs, and do not patronize their school as they should. They manage to get about half their subsistence by labor in civilized pursuits.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
KANSAS.			
Kansas agency.			
248 Kickapoos	20,273	$6,428 forever	About half the Kickapoos and Pottawatomies live in houses and cultivate farms; all wear citizens' dress; 75 children attend school. The Chippewas and Munsees are thrifty farmers, who take care of themselves, and are ready for citizenship.
450 Pottawatomies	77,358	20,647 forever	
60 Chippewas and Munsees	4,395	9,244, indefinite; $2,449 forever	
Not under an agency.			
200 Mokahoko Sac and Fox	.....	.....	Vagrants, who should go to the Sac and Fox reserve in the Indian Territory.
MICHIGAN.			
Mackinac agency.			
6,000 Chippewas and Ottawas	.....	$1,079 forever	All but the Pottawatomies have adopted civilized dress and habits of life, and have lands allotted in severalty. They do not depend in any way on the Government for support, and live by fishing and cultivating gardens and occasionally farms. The poverty of many is owing to the rapacity of the whites, who use every legal technicality to dispossess the Indians of their lands. The Government should come to their relief in furnishing schools, as they are too poor to sustain themselves. They have never failed in their loyalty to the Government. The Pottawatomies are the degraded, vanishing remnant of their former powerful tribe.
1,500 Chippewas of Lake Superior	55,235	.....	
2,500 Chippewas of Saginaw, &c	11,097	.....	
56 Pottawatomies	.....	$400 forever	
MINNESOTA.			
Leech Lake agency.			
1,501 Pillager Chippewas	94,440	Schools, $3,000, 7 years; goods, &c., $12,000, 17 years; money annuity, $10,660, 17 years; cash annuity, $700, 7 years.	They are for the most part blanket Indians, living on lands nearly worthless except for timber, and subsisting mainly by fishing. Corn is raised on a few patches of arable land. A boarding-school has 30 pupils, all it can accommodate.
701 Mississippi Chippewas	320,000		
Red Lake agency.			
11,191 Red Lake Chippewas	3,200,000	Money annuity, $10,000, indefinite; goods, &c., $8,000, 1 year; employés, $6,400, 1 year.	About half wear citizens' dress and one-third live in houses. Their lake furnishes abundance of fish, which, with a good annual crop of corn, render them independent of government rations. Their progress in civilization is slow, and cannot be hastened much without more funds for agricultural implements, materials for building houses, stock, schools, &c.
White Earth agency.			
1,847 Mississippi Chippewas 544 Pembina Chippewas 503 Pillager Chippewas	796,672	Money annuity, $25,000, 7 years; salary chiefs, $1,000, 15 years; gilling twine, &c., $4,000, 1 year.	The Mississippi Chippewas have houses, farms, stock, and are able to subsist comfortably (when not attacked by grasshoppers) by the products of their farms and some fishing. The Pembinas and Piillagers have made less advance in civilization, cling to the blanket and wigwam, and depend mostly on hunting and fishing. A good boarding-school has 114 pupils.

MONTANA.			
Blackfeet agency.			
7,300 Blackfeet, Bloods, and Piegans	26, 430, 200	Civilization, $50,000, indefinite	Scarcely any steps in civilization have been taken by these Indians. The removal of the Fort Peck agency to Poplar River, where good farming lands can be found, has awakened a little interest in agriculture among the Indians of that agency. All subsist by hunting and the issue of government rations Game is still too abundant and accessible to make apparent either the desirability or necessity of engaging in civilized labor.
Fort Belknap agency.			
600 Gros Ventres		$45,000, indefinite	
1,100 River Crows		Share with other Crows	
1,093 Assinaboines		$30,000, indefinite	
Fort Peck agency.			
4,395 Yanctonnais Sioux		.....	
626 Assinaboines		Share with other Assinaboines	
Crow agency.			
2,200 Mountain Crows	6, 272, 000	Clothing, $22,723, 21 years; civilization, $40,000, 2 years, and $10,000, 1 year; schools, $3,000, 3 years; employes, $9,150, indefinite.	
Flathead agency.			
54 Flatheads on reservation	1, 433, 600	Schools, employés, and useful articles, $10,000, 2 years, and $2,000, 1 year.	About half live in houses. A few cultivate farms, and live in comparative comfort; the majority depend on hunting and fishing. A boarding-school has 55 pupils.
295 Flatheads in Bitter-Root Valley			
315 Kootenais			
848 Pend d'Oreilles			
NEBRASKA.			
Great Nemaha agency.			
105 Sac and Fox	8, 014	$9,287 forever	The Sac and Fox are indolent, unenterprising, depending on the government for three-quarters of their support The Iowas are generally industrious and prosperous farmers, who compare favorably with their white neighbors. One-fifth of the tribe is in school.
109 Iowas	161, 006	$12,386 forever	
Omaha agency.			
1,061 Omahas	143, 225	$20,000, 5 years; $10,000, 12 years	The Omahas are slow in adopting houses and citizens' dress but are taking hold of farming well, and last year cultivated 1,800 acres, raising 9,000 bushels wheat, 27,000 bushels corn, and 5,000 bushels vegetables. Their boarding-school has 60 pupils.
Otoe agency.			
432 Otoes and Missourias (confederated)	44, 093	Money or otherwise, $9,000, 5 years; $1,000, 10 years.	They are the most backward in civilization of all the Indians in Nebraska, probably due to their receiving for many years a large cash annuity. The necessities of the situation are now waking them up to civilized labor. Half their children of school-going age are in a boarding-school, but the sentiment of the tribe is not in favor of education.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
Santee agency.			
744 Santee Sioux	115,076	Share with other Sioux in Dakota	The Santees have houses, farms, implements, churches, and schools, and are a civilized, Christian community, differing from their white neighbors only in being without the jurisdiction of law. For many years they have received only half rations from the government, and those in return for labor. In a few years the government ration should gradually be reduced to nothing.
Winnebago agency.			
1,410 Winnebagoes	104,844	$44,162, forever	(About 900 Winnebagoes in Wisconsin also share in this fund.) In 9 years they have come from turbulent barbarism to orderly semi-civilization, as shown by their 125 houses, their 2,000 acres under cultivation, and their crops of 3,000 bushels wheat, 20,000 bushels corn, and 4,000 bushels vegetables, raised by their own labor on lands allotted in severalty. Eighty children are in the boarding-school.
NEVADA.			
Nevada agency.			
300 Piutes on Moapa reserve	1,000	$5,000, 6 years	Those on the Moapa reserve and Shoshone farms have made a small start in farming. Those on Pyramid Lake and Walker River prefer fishing to digging for a living. The others are wretchedly poor, homeless, and wandering.
500 Piutes on Pyramid Lake reserve	322,000		
600 Piutes on Walker River reserve	318,315		
300 Shoshones on Shoshone farms	522		
1,600 Piutes in California, Nevada, Arizona, and Utah.			
Western Shoshone agency.			
,000 Western Shoshones 600 Goship Utes	256,000	$5,000, 6 years	A good reservation just set apart for their benefit furnishes these Indians their first opportunity to farm and have permanent homes. If they live up to their protestations, that all they want is a fair chance to support themselves, they will soon be able to report progress in civilization. Hitherto they have been vagabonds, picking up a living as best they could, and occasionally working for settlers. They will need considerable help in the way of seeds, agricultural implements, and materials for houses, and partial subsistence until crops can be raised.
NEW MEXICO.			
Mescalero agency.			
2,168 Apaches	570,240		They have taken but few steps out of barbarism, and depend entirely on the government for support.

Navajo agency.			
11,868 Navajoes	3,323,000	Useful articles, $452——1 year, $30,470, 2 years. Schools, $2,000, 3 years.	The Navajoes are accustomed to labor, raise corn and sheep, and receive very little subsistence from the government. They own 200,000 sheep, from the wool of which they manufacture cloth and blankets which are famed for their superior quality. In education and house-building the Navajoes have scarcely made a beginning.
1,339 Moquis Pueblos			The Moquis have always cared for themselves by hard work. They ask nothing from the government but a little clothing and a few implements, and they need a good boarding school. They are on lands in Arizona to which they possess no title except that of continued occupancy for generations.
Pueblo agency.			
8,400 Pueblos	668,691		They have always supported themselves on lands obtained under old Spanish grants. Government provides schools in which are 200 pupils. An agent is needed only to look after their land interests and protect them from seizure by whites.
NEW YORK.			
New York agency.			
5,041 Senecas, Oneidas, Onondagas, Cayugas, Tuscaroras, and St. Regis Indians.	86,366	$16,249, forever; $4,500, forever	They are located on seven reservations, and are self supporting. A majority are prepared for citizenship, while the St. Regis Indians and some others are still far down in the scale of civilization.
NORTH CAROLINA.			
Eastern Cherokee agency.			
2,200 Eastern Cherokees	65,211		They wear citizens' dress, live in rude houses, have small farms, and manage to get along in a primitive fashion, very much as the poor whites in their vicinity do. They have a fund of $40,874.10, which bears interest at 5 per cent. From this fund, by act of Congress, they are authorized to draw annually for education and agriculture so much as shall, with the interest, amount to $6,000. Some of them are located in Georgia, South Carolina, and Tennessee.
OREGON.			
Grand Ronde agency.			
789 Molels and Clackamas	61,440	Education, $3,000, indefinite	All live in houses, wear citizens' dress, have cultivated fields, and receive no rations from the government. Seventy-six children are in school.
Klamath agency.			
667 Klamaths 93 Modocs 137 Walpahpee Snake	2,056,000	Employés, &c., $9,000, 3 years; $1,000, 9 years; $5,100, 8 years; $1,200, 10 years.	Have made no special progress in civilization, and subsist mainly by hunting, fishing, &c.
Malheur agency.			
564 Pi-Utes 195 Snakes	1,778,560		In about the same condition as the Indians of Klamath agency.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
Siletz agency.			
1,085 Alseas, Nestuccas, Chetcoes, Coquilles, &c.	228,800	.....	In about the same condition as the Indians of the Grand Ronde Agency, with the exception of about 400 Indians who have removed to the Siletz reserve within three years, and to whom no help could be given for want of funds.
Umatilla agency.			
320 Walla-Wallas 344 Cayuses 185 Umatillas	268,800	Pay 3 chiefs, $1,300, 2 years Employés, &c., $12,000, 2 years Useful articles, $2,000, 2 years	The majority of these Indians support themselves by agriculture and stock-raising. A day-school has an average attendance of 28 pupils.
Warm Spring agency.			
264 Wascos 193 Warm Springs 51 Teninos	464,000	$8,100, 2 years	All wear citizens' dress; two-thirds live in houses. Half their subsistence is obtained by labor in civilized pursuits for themselves or neighboring farmers; the other half is obtained by fishing and some hunting. There being only a day-school, irregularly attended by 50 pupils, but little advance in education has been made by the tribe. Morally, a great advance has been made. Drunkenness is rare.
On Columbia River.			
2,000 renegades and others	.....	.....	Vagrants who roam along the Columbia River in Oregon and Washington Territory, living by fishing, hunting, and raising cattle.
UTAH.			
Uintah Valley agency.			
639 Uintah Utes	2,039,040	$1,000, 20 years. Also share in funds credited to Utes in Colorado.	Those on the reserve, about 400, have small farms, aggregating 300 acres, and 550 head of cattle, and are thus able to provide one-third their subsistence; the balance is obtained by hunting, supplemented by government rations. In schools, and houses, and other civilized habits little impression has been made on them.
Not under an agent.			
134 Pah Touts 256 Goship Utes	.....	.....	Vagrants.
WASHINGTON TERRITORY.			
Yakama agency.			
3,650 Yakamas and others (14 tribes)	800,000	$22,400, 2 years	A good soil, a faithful, capable agent for 10 years, and $22,400 per annum for 18 years (none of it cash annuity), have made successful farmers and stock-raisers out of savages; 6,600 acres are under cultivation. A crop (last year) of 30,600 bushels wheat, 8,000 bushels other grain, and 7,600 bushels vegetables, with a herd of 3,570 cattle, make these Indians independent either of government rations or of hunting and fishing. Only 10 children are in school for want of school-houses and——

Colville agency.			
450 Cœur d'Alenes 685 Spokanes 650 Colvilles 242 Lakes 395 Calispels 330 O'Kinakans 340 San Poels 315 Methows	736, 000 2, 800, 000		
Neah Bay agency.			
564 Makahs 244 Quillehutes	230. 40	$3,600, 2 years	Many of these reservations are difficult of access, and most are unsuited, either by climate, or soil, or both, to agriculture. The Puyallups, who have good land, have farms and houses, and, having been furnished with employés and schools, are well advanced in civilization. A few in the S'Kokomish and Tulalip agencies have made equal progress. The Spokanes and some of the Cœur d'Alenes and Colvilles have cultivated fields to which they have no title, and from which they are likely to be driven. While undisturbed they will be industrious and enterprising, and will live comparatively comfortable in a civilized way.
Puyallup agency.			
526 Puyallups	18, 062		The remaining tribes are scattered about, some off, some on reservations, hunting, fishing, working in lumber-camps, and helping settlers in farm-work. Abundance of fish, both for sale and consumption, place them out of danger of hunger. Except that they are barbarians, the government would not need to come to their help. To lift them out of barbarism up to civilization will require a large outlay of money, and a careful selection, for their benefit, of lands on which a white man could live in a civilized way. They know how to work better than how to live.
228 Nisqually	4, 717		
43 Squorins	1, 494		
165 Chehalis	4, 225		
92 Shoalwater Bays	335		
Quinaielt agency.			
122 Quinaielts 84 Hoks 105 Queets	224, 000	$7,800, 2 years	All these Indians wear citizens' dress. Each agency has a boarding-school; but the whole number of children thus reached is only 200.
S'Kokomish agency.			
250 S'Kokomishes 550 S'Klallams	4, 987	$8,700, 2 years $500, indefinite	
Tulalip agency.			
2,900 D'Wamish, Snohomish, Swinamish, and others.	*52, 648	$11,950, 2 years	
WISCONSIN.			
Green Bay agency.			
1, 368 Menomonees	231, 680	$16,179, 3 years; $7,753, forever	With the exception of the Menomonees, they have generally adopted the manners and customs of civilized life, and are nearly ready for citizenship. The Menomonees have not wholly abandoned the wigwam and still hold property in common; and though all are engaged in farming, it is carried on in the shiftless wasteful manner of quasi-civilization.
124 Stockbridges	11, 520	$3,790 forever	
1, 324 Oneidas	65, 540	Have $1,000 of fund credited to New York Indians.	
900 Winnebagoes			The Winnebagoes share in the fund credited to the Winnebagoes in Nebraska. One-half of them are taking up land in Wisconsin under the homestead law. The remainder with the Pottawatomies are vagrants.
180 Pottawatomies			

* In five reservations.

Tabular statement showing location of agencies and Indian tribes, number of Indians, funds due, &c.—Continued.

Name of agency and tribes, and number of Indians.	Number of acres in reserve.	Amounts due under treaty, per annum.	Status and prospects of Indian tribes.
La Pointe agency.			
Chippewas:			
726 at Red Cliff	13,993		Want of funds, or inaccessibility, or unfitness of reservation has prevented any successful attempts at civilization being made except at Red Cliff, Bad River, and Loc Cour d'Oreilles. At those points enough has been accomplished to put about half the Indians in a fair way to earn their own living by their own farming and in other civilized ways. They have also adopted citizens' dress and built themselves houses. Most of the land cultivated has been "cleared" with great labor. A good boarding-school, with 80 pupils, at Bad River is having a marked influence for good on that reservation.
734 at Bad River	124,333	$1,800, indefinite	
1,079 at Loc Cœur d'Oreilles	69,136		
665 at Loc du Flanders	69,324		
404 at Fond du Lac	100,121		
262 at Grand Portage	51,840		
760 at Boise Forts	101,509	Schools, employés, &c., $14,100, 3 years.	
WYOMING.			
Shoshone agency.			
1,800 Shoshones 198 Northern Arapahoes	1,520,000	Clothing, $13,355, 22 years; useful articles, $30,000, 3 years; employés, $7,000, indefinite; cattle, $5,000, 2 years; clothing, $7,500, 21 years; articles, $9,000, 1 year; employés, $3,000, forever.	Have made little progress and depend on the government for three-fourths of their subsistence.
In Kansas, Indiana, Tennessee, Georgia, Florida, and Texas are scattered about 900 Seminoles, Lipans, Tenkanas, Miamies, and other Indians.		$23,702, forever	
Total Indians in United States			251,433.
Total number of acres included in Indian reservations.			150,326,915.
Number of acres cultivated by Indians in 1877.			292,550.
Number of bushels of wheat raised by Indians in 1877.			688,278.
Number of bushels of corn raised by Indians in 1877.			4,656,952.
Number of bushels of vegetables raised by Indians in 1877.			556,975.
Number of tons of hay cut by Indians in 1877.			148,473.
Number of houses occupied by Indians in 1877.			22,199.
Number of houses built by Indians in 1877.			944.

Number of Indian children in school in 1877.	.....	.....	6,019, exclusive of civilized tribes in Indian Territory.
Number of children of civilized tribes in school, 1877.	.....	.....	5,496.
Number of Indians wearing citizens' dress in 1877.	.....	.....	112,903.

DEPARTMENT OF THE INTERIOR,
Washington, September 11, 1878.

SIR: In reply to communication of 22d May last, from committee on transfer of Indian Bureau, I transmit herewith copy of letter dated 10th instant, from the Commissioner of Indian Affairs, and accompanying statement, showing the names of the various Indian tribes; their respective numbers, location, extent of land they hold and occupy, their present condition; the amount of moneys or supplies due each of the tribes to date; the number of agencies or subagencies that are attached to each tribe, the location of said agencies, names of agents and their respective salaries, &c., &c.

Very respectfully, your obedient servant,

C. SCHURZ, *Secretary*.

CHARLES L. FLANAGAN, Esq.,
Clerk Committee on Transfer of Indian Bureau.

DEPARTMENT OF THE INTERIOR,
OFFICE OF INDIAN AFFAIRS,
Washington, September 10, 1878.

SIR: I am in receipt by department reference of a communication from the Hon. Alvin Saunders, chairman of the joint committee of Congress to report on the advisability of transferring the Indian Bureau to the War Department, requesting that there be prepared for the use of said joint committee a statement showing the names of the various Indian tribes, their respective numbers, location, extent of land they hold and occupy, their present condition, and the facts, if any, upon which may be based their prospective improvement; also, the amount of moneys or supplies due each of the tribes to date; also, the number of agencies or subagencies that are attached to each tribe, the location of said agencies, names of the agents and their respective salaries, and all facts and figures relating to the expenses of these agencies, including the pay of interpreters.

In accordance with the honorable chairman's request, I have the honor to forward herewith said statement.

Very respectfully,

E. A. HAYT, *Commissioner*.

The Hon. SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR,
OFFICE OF INDIAN AFFAIRS,
Washington, September 23, 1878.

SIR: Inclosed herewith I forward an additional paper in connection with "Statement showing the views of the various Indian tribes on the question of the transfer of the Indian Bureau," transmitted to you on the 21st instant, it being a copy of the circular-letter from this office directing that such views be obtained at the various Indian agencies from the Indians in council assembled.

Very respectfully,

WM. M. LEEDS,
Acting Commissioner.

CHAS. L. FLANAGAN,
Clerk Committee on Transfer of Indian Bureau.

DEPARTMENT OF THE INTERIOR,
OFFICE OF INDIAN AFFAIRS,
Washington, July 18, 1878.

SIR: You are hereby directed to call a general council of your Indians, and to make inquiry of them as to their wishes respecting the transfer of the Indian Bureau to the War Department. You are forbidden to influence them in any manner, but must so present the subject to them that they may be encouraged to give a free and frank expression of their opinions and desires respecting it. You will see that their wishes are expressed in proper form and signed by the chiefs as representatives of their bands, giving the number of Indians whom each represents. Call upon them to give reasons for their preferences, and when there is a division of sentiment as to the transfer, let each party present their wishes in due form and give their reasons, respectively.

Your early attention is requested.

Very respectfully,

WM. M. LEEDS,
Acting Commissioner.

Statement showing the views of the various Indian tribes on the question of the transfer of the Indian Bureau to the War Department, as expressed by their chiefs in council, as per accompanying exhibits.

Name of agency.	Name of tribe.	Number of Indians, including men, women, and children.	Number of Indians in favor of transfer.	Number of Indians opposed to transfer.	Number of exhibit.	Abstract of remarks of agent in letter transmitting report of Indian council on the question of the transfer.
Great Nemaha, Nebraska	Sac and Fox	105	4	101	1	The Iowa chiefs do not represent their bands except in name; chieftainship does not exist among the Iowas. But a small portion of the tribe was present; several refused to express an opinion, and all to give a reason for an opinion.
	Iowa	217	12	5		
Green Bay, Wisconsin	Stockbridges	124	0	124	2	
	Oneidas	1,324	15	61	.....	Only seventy-six Oneidas present, rest in harvest-field. Most of chiefs were present, and were willing to vote, but would not put their names to paper, lest they might be understood as committing their people. The one chief and fourteen warriors who voted for the transfer, based their preference on the hope that it would allow them to sell their timber freely.
	Menomonees	1,368	73	106	3	All chiefs present, and all but one opposed the transfer; would vote, but would not commit their people by signing a paper. Those in favor of the transfer thought it would open the door to their immediate citizenship.
Shoshone, Wyoming	Shoshones	1,250	0	1,250	4	Two Army officers were present, who explained to the Indians the business before them.
	Northern Arapahoes	938	0	938		
Leech Lake, Minnesota	Pillager Chippewas	1,501	0	1,501	5	In order to have the expression of opinion unbiased, the agent was absent from the reservation on the day of the council. The Mississippi Chippewas are so distant and scattered, that it was impracticable to call a council.
	Mississippi Chippewas	701	0	.....	.....	
New York, New York	Senecas	2,338	0	2,338	6	
	Tonawanda Senecas	579	0	579		
	Onondagas	491	0	491		
	Tuscaroras	411	0	411		
	Cayugas	182	0	182		
	Oneidas	249	0	.....	.....	They were not represented in council.
	St. Regis	775	0	775	7	
Flandreau, Dakota	Santee Sioux	364	0	364	8	
Crow, Montana	Crows	3,300	0	.....	9	Most were off hunting. Such as assembled in informal council expressed decided aversion to transfer.
Nevada, Nevada	Pi-Utes	300	0	300	10	
	Pah-Utes	1,100	0	1,100		
	Shoshones	300	0	300		
Tule River, California	Tules and Tejons	254	0	254	11	
Pima, Arizona	Pimas and Maricopas	4,461	0	4,461	12	

Statement showing the views of the various Indian tribes on the question of the transfer of the Indian Bureau to the War Department, &c.—Continued.

Name of agency.	Name of tribe.	Number of Indians, including men, women, and children.	Number of Indians in favor of transfer.	Number of Indians opposed to transfer.	Number of exhibit.	Abstract of remarks of agent in letter transmitting report of Indian council on the question of the transfer.
Sisseton, Dakota	Sisseton and Wahpeton Sioux	1,715	.....	.....	13	1,500 represented in council. Indians wish to take care of themselves, free from either civil or military agents.
Kiowas and Comanches, Indian Territory.	Kiowas	1,090	0	1,055	14	Every chief present protested against the transfer. Agent is satisfied that all absentees were of the same mind.
	Comanches	1,545	0	993		
	Apaches	343	0	161		
White Earth, Minnesota	Mississippi Chippewas	1,847	0	1,847	15	Subject was not discussed by agent or employés with Indians. Speeches reported verbatim.
	Pillager Chippewas	503	0	503		
	Pembina Chippewas	544	.....	.....	.....	
Siletz, Oregon	Neztucca, Klamath, Alseas, and twelve other bands.	1,085	0	1,085	16	No letter of transmittal.
Warm Springs, Oregon	Wascos, Warm Springs, and Teninos.	560	.....	.....	17	There was but a small attendance at the council. Head chief and one councilor opposed the transfer, and one councilman favored it. The leading Warm Spring man, who decidedly opposes the transfer, was absent.
Mackinac, Michigan	Chippewas	10,000	0	10,000	18	No letter of transmittal.
Los Pinos, Colorado	Utes	800	.....	.....	19	Ouray, head chief, is indifferent. Other speakers nearly so, with slight preference for civil rule.
Sac and Fox, Indian Territory.	Sac and Fox	433	0	433	20	Chekoskuk believed Congress would do as it pleased, without regard to the preferences of the Indians.
	Absent Shawnees	661	.....	.....	.....	
	Mexican Kickapoos	317	.....	.....	.....	
White River, Colorado	Utes	900	0	900	21	No letter of transmittal.
Fort Peck, Montana	Assinaboine	1,719	0	1,719	22	No remarks.
	Yanctonnais Sioux	4,395	0	4,395	.....	
Moquis Pueblo, New Mexico	Moquis Pueblo	1,300	0	873	23	Two chiefs with their bands were absent from the council.
Neah Bay, Washington Territory.	Makahs	564	0	564	24	No influence to effect their decision was brought to bear on the Indians.
	Quillehutes	244	0	244		
Santee, Nebraska	Santee Sioux	744	279	465	25	Five councilors were against, and three for, the transfer. Their reasons were stated by the former, but the latter refused to give any.
Quinaielt, Washington Territory.	Quinaielt	125	0	125	26	
	Queet	102	0	102		
	Hoh	82	0	82		
Devil's Lake, Dakota	Sisseton and Wahpeton Sioux	1,075	213	862	27	
Colorado River, Arizona	Mojave	1,231	0	990	28	About one hundred young men of agency who do not belong to any band are not included.
	Cœur d'Aléne	450	0	383		Chief absent harvesting
	Spokane, Upper	383	2			Chief claimed to speak for his people
	Spokane, Lower	318				Two chiefs speak only for themselves

Colville, Washington Territory.	San Poel	200	.....	.....	29	Chief absent harvesting. Agent considers those absent as opposed to the transfer.
	Methow	315	.....	.....		....do
	Lake	242	.....	.....		....do
	Colville	650	1	2		One chief for, two against transfer
	Calispel	395	.....	.....		Not represented
	O'Kinakane	310	2	.....		Chiefs spoke only for themselves
	Pend d'Oreilles and Kootenais	455	0	455		Two chiefs spoke for their people.
Grand Ronde, Oregon	Molels, Clackamas, and eleven other tribes.	797	0	797	30	No letter of transmittal.
Flathead, Montana	Flatheads	100	0	100	31	The head chief of the Kootenais was in British America. The Flatheads in Bitter Root Valley were not represented in the council.
	Kootenais	315	.....	.....		
	Pend d'Oreille	848	0	848		
	Flatheads off reserve	295	.....	.....		
Red Lake, Minnesota	Chippewas	1,163	0	1,049	32	One hundred and fourteen not represented on account of absence of chief.
Cheyenne River, Dakota	Sioux	2,025	0	2,025	33	
Winnebago, Nebraska	Winnebagoes	1,410	0	1,266	34	
Otoe, Nebraska	Otoes and Missourias	452	350	0	35	The remaining one hundred of the tribe, though fully represented in the council, refused to express their views on account of jealousy of the other faction. They probably have same view.
Cheyenne and Arapaho, Indian Territory.	Cheyennes	3,236	0	3,236	36	Military officers were present on invitation of agent.
	Arapahoes	1,766	0	1,766		
Tulalip, Washington Territory.	Snohomish, D'Wamish, &c	2,900	0	2,199	37	All represented in council were of one opinion.
Uintah, Utah	Uintah Utes	430	0	430	38	
	Goship Utes	209	.....	.....	.....	
San Carlos, Arizona	Apaches	4,277	0	4,277	39	In talking over matter Indians became so excited that agent did not dare ask them to sign a paper.
Fort Berthold, Dakota	Arickarees	654	0	654	40	Indians requested Army officer to be present at council. Their reasons for opinion were, 1st, The benefits of the Army to protect them from fraud; 2d. Their tyranny in case they had the sole government.
	Gros Ventres	365	0	365		
	Mandaus	273	0	273		
Omaha, Nebraska	Omahas	1,061	.....	57	41	These fifty-seven represent the "young men's party" of the tribe. The "chiefs' party" refused to take part in anything in which the other party was recognized, and would express no opinion, though urged to.
Blackfeet, Montana	Blackfeet	7,300	0	5,100	42	The head chief and nearly seventy head men of the tribes were present. The question was carefully considered, and each band chief gave public expression of his wish. The decision was unanimous against the transfer. It would be looked upon as an unmerited punishment to put them under military rule.
	Blood					
	Piegan					
Pueblo, New Mexico	Jicarilla Apache	9,149	0	1,450	43	This is the opinion of the inhabitants of four Pueblos. The rest are scattered over such a wide extent of country that it is difficult to get them together. These Indians understand that there is no cause for their military management, which is not also found in the most law-abiding district in the oldest State.
	Ute					
	Pueblo					
Standing Rock, Dakota	Blackfeet Sioux	2,515	223	1,913	44	Reasons given against transfer are that at time of signing treaty commissioners promised them a civil agent, without which promises they would not have signed the treaty. It makes their hearts bad to be governed by men who carry guns. They want a civil agent to teach them to farm and raise cattle. Reasons in favor of transfer are that civil authorities have not fulfilled treaty stipulations, and it would be well to try a military agent and see if he would not give them the wagons and farming implements promised.
	Oncapapa Sioux					
	Lower Yanctonnai					
	Upper Yanctonnai					
	Sioux					

Statement showing the views of the various Indian tribes on the question of the transfer of the Indian Bureau to the War Department, &c.—Continued.

Name of agency.	Name of tribe.	Number of Indians, including men, women, and children.	Number of Indians in favor of transfer.	Number of Indians opposed to transfer.	Number of exhibit.	Abstract of remarks of agent in letter transmitting report of Indian council on the question of the transfer.
Quapaw, Indian Territory	Shawnee, Seneca, Wyandott, Ottawa, Modoc, Quapaw, Confederated Peorias, &c, Straggling Pottawatomies	1,345	0	922	45	The desire was unanimous that they should remain under the care of Interior Department.
Wichita, Indian Territory	Caddo, Comanche, Keechie, Tawacanie, Waco, Wichita	1,329	0	1,329	46	The council was very large.
Kansas, Kansas	Kickapoo, Pottawatomie, Chippewa	758	0	450	47	This expression of opinion represents only the Pottawatomie Indians. The others were not present at the council. A Kickapoo chief who was present expressed himself as strongly opposed to the transfer.
Western Shoshone, Nevada	Western Shoshones, Goship Ute	3,600	0	2,000	48	Their reasons were that the military officers were stern and arbitrary in their manners, and did not want to listen to Indian talk or reasons. The soldiers debauched their women and gave great trouble. Only one Indian, a leading man, said that the change did not matter to him.
Umatilla, Oregon	Walla Walla, Cayuse, Umatilla	849	849	0	49	Their reasons were that the soldiers could better protect them in their rights.
Skokomish, Washington Territory	Skokomish, S'Klallam	800	0	800	50	This paper is entirely of Indian manufacture. It was written by an Indian and all the signatures are by Indians.
Southern Ute, Colorado	Utes	934	795	0	51	Reasons given are: Because cattle are slaughtered by the agency, instead of issuing them on foot; because they do not want farm; because they want to be as before, at peace with everybody.

Nez Percé, Idaho	Nez Percé	2,800			52	James Lawyer, head chief, spoke in favor of transfer, and said he represented 148 Kamiah men and all that people, although but 50 Kamiahs were present; 126 out of 348 adult male Nez Percé were present. Of the speakers, 13 expressed themselves in favor of the transfer and 5 against, Moses among the latter. After council adjourned the brother of Lawyer, head chief, and several Indians came to agent and requested that another council be called to reconsider, but agent refused, saying if he did so it would be said he tried to influence them. The chiefs think that under the Army they will be recognized fully as heads of their people, and the people themselves as privates in the Army, and that the importance of the chiefs will be thereby increased.

DEPARTMENT OF THE INTERIOR, OFFICE OF INDIAN AFFAIRS,
Washington, November 30, 1878.

SIR: Inclosed herewith I respectfully transmit, for the use and information of the joint committee on the advisability of the transfer of the Indian Bureau to the War Department, a table showing the status and progress of Indian tribes in civilization.

Very respectfully,

WM. M. LEEDS,
Acting Commissioner.

Maj. CHAS. L. FLANAGAN,
Clerk Committee of Transfer of Indian Bureau.

Table showing status and progress of Indian tribes in civilization.

Name and location of agency.	Number of Indians.		Size of reserve.	Number of acres.			Number of Indians engaged in civilized pursuits.	Number of Indians living in houses.	Moral condition of Indians compared with neighboring illiterate whites.
	Belonging to agency.	On reservation.		Tillable.	Pasture.	Timber.			
ARIZONA.									
			Acres.						
Colorado River	1,100	1,100	85,000	25,000	20,000	40,000	200		More temperate.
Moquis Pueblo	1,790	(*a*)	1,700,000	10,000	b500,000		1,790	1,790	Equally good.
Pima	11,000	11,000	210,000	30,000	14,000	16,000	11,000	11,000	Do.
San Carlos	4,502	4,502	2,528,000	1,600	500,000	25,000	800		Do.
CALIFORNIA.									
Round Valley	1,700	900	102,118 19/100	6,000	80,000	20,000	Nearly all	One-third	Equally good.
COLORADO.									
Los Pinos	4,000	1,500	11,724,800	500,000	4,000,000	500,000	10 in farming; several hundreds in herding.	1 (Ouray)	Equally good.
DAKOTA.									
Devil's Lake	1,075	1,008	275,000	225,000	All	50,000	1,075	152 families	Equally good.
Fort Berthold	1,400	1,291	8,320,000	4,992,000	832,000	250,000	250 families	All	
Red Cloud	6,000		Unknown	Unknown	Unknown	Unknown	Unknown	None	Compares favorably.
Sisseton	1,500	1,500	918,780	600,000			All	All	Better.
Standing Rock	2,444		33,500,000	(*c*)	(*c*)	(*c*)	Nearly all	250	Compares favorably.
Yankton	2,112	2,112	430,400	286,933	Nearly all	500	Three-fourths	Nearly all	About the same.
IDAHO.									
Fort Hall	1,705	1,011	1,800,000	5,000	1,300,000	495,000	1,000	1 family	Worse.
Lemhi	950	151	64,000	1,500	10,000	150	26		Compares favorably.
Nez Percé	1,656	1,156	746,651	10,000	350,000	386,651	600	100 families	Do.
INDIAN TERRITORY.									
Cheyenne and Arapahoe	5,054	5,054	760,000	20,000	400,000	150,000	250	75	Superior.
Kiowa and Comanche	2,950	2,939	2,968,893	200,000	2,500,000		500	200	About the same.
Pawnee	1,440	1,440	265,000	50,000	130,000	25,000	All	40 families	Compares favorably.
Sac and Fox	1,719	433	483,840	120,000	202,560	161,280	1,200	1,200	Do.
Wichita	1,335	1,335		20%	70%	10%	All	1,000	More temperate and peaceable.

IOWA.									
Sac and Fox	345	345	692	500	250	192	72		Compares favorably.
KANSAS.									
Pottawatomie	1,041	737	102,025	47,119	94,238	7,787	737	All in summer; wigwams in winter.	Compares favorably.
MICHIGAN.									
Mackinac	10,000		40,000			40,000	Nearly all	Nearly all	Equally good.
MINNESOTA.									
Leech Lake	2,389	2,389	414,440	2,000		412,440	400 families	70 families	Compares favorably.
Red Lake	1,163	1,163	3,000,000	1,000,000	1,000,000	1,000,000	925	950	Lower as to chastity.
White Earth	2,858	1,911	829,440	552,960	103,680	552,960	995	1,200	Much better.
MONTANA.									
Blackfeet	7,600	15,200	20,000,000	1,800,000	15,000,000	700,000	10	30	Compares favorably.
Crow	3,300		Not surv'd.	One-tenth			15	15	Nearly the same.
Flathead	1,450	1,450	1,443,600	400,000	10,000	998,000	500	750	Far superior.
Fort Peck	5,500			One-half	Nine-tenths	1 in 50	22		Rather lower.
NEBRASKA.									
Great Nemaha	320	300	24,014	22,000	22,000	1,800	80	243	Superior.
Omaha	1,100	1,100	193,000	160,000	175,000	8,000	400	600	Compares favorably.
Santee	750	750	115,000	25,000	88,000	2,000	750	750	Superior.
Winnebago	1,460	1,444	109,844	100,000	97,500	9,844	1,444	1,200	Equally good.
NEVADA.									
Nevada	1,800		320,337		Nearly all	500	800	50	Compares favorably.
Western Shoshone	3,600	1,000					Two-thirds		Do.
NEW MEXICO.									
Abiquiu	700								Equally good.
Navajo	11,800	7,000	3,456,000	20,000	1,500,000	500,000	11,800		Compares favorably.
NEW YORK.									
New York	4,140	4,140	84,240	30,292	9,750	7,795	4,140	4,140	Superior.
OREGON.									
Malheur	846	200	1,778,560	12,000	1,516,560	200,000	140		Compares favorably.
Siletz	1,085	700	222,720	2,000	1,000	178,120	1,075	1,085	Do.

a Have no reservation. *b* Very poor. *c* No estimate.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Number of Indians.		Size of reserve.	Number of acres.			Number of Indians engaged in civilized pursuits.	Number of Indians living in houses.	Moral condition of Indians compared with neighboring illiterate whites.
	Belonging to agency.	On reservation.		Tillable.	Pasture.	Timber.			
OREGON—Continued.									
Umatilla	1,000	873	326,551	150,000	150,000	80,000	Nearly all	50	Compares favorably.
Warm Springs	500	300	1,153,600	5,000	512,000	512,000	300	300	Superior.
UTAH.									
Uintah Valley	430	430	2,500,000	320,000	960,000	318,300	85 families	6 families	Compares favorably.
WASHINGTON.									
Colville	3,457	3,457	3,536,000	32,000	286,000	3,208,000	2,000	555	Compares favorably.
Neah Bay	1,022	713	36,000	400	2,000	*a*30,000	20	36	Do.
Puyallup, &c	1,731	*b*1,133	28,837	12,235	6,535	19,150	Three-fourths	All, during winter.	Puyallup, Nisqually, and Chehalis Indians superior to neighboring whites; the other tribes of agency more degraded.
Quinaielt	309	227	224,000	20	3	223,977	All	10 families	Compares favorably.
S'Kokomish	800	250	4,980	1,000	1,000	1,000	800	800	About the same.
Tulalip	2,900	1,013	15,360	1,200	10,000	2,900		2,900	Compares favorably.
WYOMING.									
Shoshone and Bannock	2,188	2,035	1,520,000	31,000	1,520,000	62,000	1,000	15	Compares favorably.

a About.

b Five reserves.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Prevalence of intemperance and disease.	Obstructions to progress of Indians in education, morality, Christianity, and self-support.	Illiteracy of Indians. Is it due to aversion to education or lack of educational facilities?	Amount (additional to appropriation by Congress) expended last year for school and missionary work, and by whom contributed.
ARIZONA.				
Colorado River	Disease prevalent; cause starvation.	Want of facilities, food, clothing, and education, mental and moral.	Lack of facilities	
Moquis Pueblo	Intemperance unknown among them.	Their location in a barren country and their mode of living in crowded villages.	do	
Pima	Not generally prevalent	Want of proper educational facilities, both mental and moral, and need of good land.	do	Clothing for school children by Ladies' Union Missionary Soc., N. Y.
San Carlos	No intemperance. Disease to some extent.	Want of educational facilities, mental and moral, farming implements, mill, and employment.	do	
CALIFORNIA.				
Round Valley	To some extent	Failure of government to fulfill its promises in regard to their lands.	do	$500, Methodist Episcopal Church.
COLORADO.				
Los Pinos	Neither very prevalent	Want of facilities, means, and school accommodations.	Principally to lack of facilities.	
DAKOTA.				
Devil's Lake	Intemperance rare	The need of wholesome, uniform, and permanent laws for their government and protection, and the vexed question of transfer or non-transfer to War Department definitely settled.	To both	$90 by Catholics.
Fort Berthold			To the former	$1,500 by A. B. C. F. M.
Red Cloud		Their unsettled condition and frequent removals.	Lack of facilities	Missionary paid by Episcopal Church, amount unknown.
Sisseton	Intemperance unknown	Bad example of chief and headmen	do	$800, A. B. C. F. M.
Standing Rock	Prevail to some extent	Want of proper educational and religious facilities, and necessary assistance from government in regard to agriculture, &c.	Principally the latter	
Yankton	Disease to some extent; vsry little intemperance.	Need of enforced law		$8,018, Episcopal Church; $2,425 Presbyterians.
IDAHO.				
Fort Hall	Disease prevails to a great extent.	The want of funds	Lack of facilities	
Lemhi	Disease prevails somewhat	Dissatisfaction with present reserve, small appropriation, &c.	do	

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Prevalence of intemperance and disease.	Obstructions to progress of Indians in education, morality, Christianity, and self support.	Illiteracy of Indians. Is it due to aversion to education or lack of educational facilities?	Amount (additional to appropriation by Congress) expended last year for school and missionary work, and by whom contributed.
IDAHO—Continued.				
Nez Percé	Little intemperance; some disease.	Unsettled state of the Indian question	Aversion to use facilities	$775 by Presbyterian Board Foreign Missions.
INDIAN TERRITORY.				
Cheyenne and Arapahoe	Intemperance very rare; some disease.	Limited appropriations and facilities	Lack of facilities	$125 by New York and Philadelphia Friends.
Kiowa and Comanche	No intemperance; disease prevalent.	Lack of school accommodations, missionaries, and farmers.	In part to both	$84 by Society of Friends.
Pawnee	No intemperance; disease to some extent.	Want of schools, cattle, farming implements, and missionaries.	Lack of facilities	$350 by Society of Friends.
Sac and Fox	Disease to slight extent	Want of schools and religious instruction; contact with low whites, &c.	In part to both	$100 by Orthodox Friends.
Wichita	Disease somewhat prevalent	Uneasiness in regard to permanency of their homes.	Lack of facilities	$1,200 by Baptists; $400 by Friends.
IOWA.				
Sac and Fox	Not to any extent	Want of proper education and instruction, and allotments in severalty.	Refusal to avail themselves of facilities.	
KANSAS.				
Pottawatomie	do	Uncertain policy of the government toward them.	Partly to both in the past	$100 by Orthodox Friends.
MICHIGAN.				
Mackinac	About the same as among whites.	Want of sufficient funds to establish schools upon good basis.	Partly to both	$2,800 by Indian Bureau for schools; $1,000 for Protestant missions, and about $1,000 for Catholic missions.
MINNESOTA.				
Leech Lake	Both to some extent	Want of good land, difficulty of access to agency, and agitation of transfer question.	Both	$136 by Congregationalists, Baptists, and agency employés.
Red Lake	No intemperance; some disease	Lack of schools, farming implements, and instruction.	Lack of facilities	$380 and cows and garden-seeds by Episcopal Mission.
White Earth	None	Insufficiency of funds to carry on the work	do	$5,632 by Episcopal Church.
MONTANA.				
Blackfeet	Both almost unknown	Nomadic life and need of missionaries	do	
Crow	Some disease, contracted from soldiers.	Lack of proper education, frequent change of agent, &c.	do	

Flathead	No intemperance; some disease	Need of industrial school, and farming implements.	....do	
Fort Peck	Disease to some extent	Need of comfortable houses and civilizing influences.	....do	
NEBRASKA.				
Great Nemaha	Very little of either	Intrusion and evil example of low whites	Iowas not illiterate; Sacs and Foxes have lacked facilities in the past.	
Omaha	None	Lack of farming implements, and failure of government to fulfill treaty stipulations, &c.	Lack of facilities	
Santee	No intemperance; some disease	Refusal of Congress to pass Indian homestead law.		$7,225, Congregationalists and Episcopal Church.
Winnebago	Both to some extent		Partly to both	$130, Society of Friends.
NEVADA.				
Nevada	None	Limited appropriations, and need of more schools and teachers.	Lack of facilities	
Western Shoshone	Disease to considerable extent.	Want of funds	....do	
NEW MEXICO.				
Abiquiu	None	Lack of opportunity	....do	
Navajo	No intemperance; some disease	Want of proper education—moral and mental.	Partly to both	
NEW YORK.				
New York	Very little of either	Intemperance and want of more settled habits of industry.		$22,000 by State of New York and religious societies—not through agency office.
OREGON.				
Malheur	None	Want of funds for almost all agency purposes	To both	
Siletz	To some extent	Need of teachers, and failure of Congress to appropriate necessary funds for purchase of farming implements.	Lack of facilities	
Umatilla	Some intemperance; very little disease.	Want of a boarding school and a settled policy	....do	
Warm Springs	None	Need of farming implements and educational facilities.	....do	
UTAH.				
Uinta Valley	To some extent	Lack of educational facilities, farming implements, &c.	....do	
WASHINGTON.				
Colville	None	Lack of means to support schools	....do	
Neah Bay	No intemperance, and but little disease.	Insufficient allowance to pay farmer and opposition of old members of tribes to civilization.	Aversion to education	

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Prevalence of intemperance and disease.	Obstructions to progress of Indians in education, morality, Christianity, and self-support.	Illiteracy of Indians. Is it due to aversion to education or lack of educational facilities?	Amount (additional to appropriation by Congress) expended last year for school and missionary work, and by whom contributed.
WASHINGTON—Cont'd.				
Puyallup, &c	Very little of either among the Puyallup, Nisqually, and Chehalis Indians; but disease is prevalent among other tribes of agency.	Lack of competent teachers and educational facilities.	Lack of facilities	$100 by Presbyterians.
Quinaielt	Unknown among them	Adherence to old habits and customs	Aversion to education	
S'Kokomish	Both to some extent	Contact with low whites, lack of proper educational facilities and proper title to their lands.	Lack of facilities	$400 by American Missionary Association, and $250 by employés.
Tulalip	None	Fear of removal and lack of application	Aversion to education	
WYOMING.				
Shoshone and Bannock	Both prevalent, for which the whites are alone responsible.	Lack of educational facilities, both mental and moral.	Lack of facilities	

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Number of Indians who can read and write.		Number of children of school age.	Number attending school.	Variation from attendance of last year.	Proportion of children who can be accommodated in school.	Do Indian children differ from whites or blacks of similar social status and surroundings in aptitude for education?	Is there any insuperable obstacle to eventual civilization of Indians through the education of their children?	Are schools and missionary work the shortest roads to Indian civilization?	Percentage of Indian subsistence supplied by—	
	In school.	Out of school.								Indians.	Gov't.
ARIZONA.											
Colorado River	.....	.....	50	None	.....	No building	No	None	Yes	100	.....
Moquis Pueblo	.....	20	400	No school.	.....	½	....do	....do	....do	95	5
Pima	25	.....	1,300	60	Same	⅓	Do not learn as rapidly	....do	....do	100	.....
San Carlos	.....	.....	500	.....	.....	No school	No experience	....do	... do	20	80
CALIFORNIA.											
Round Valley	48	17	81	47	Slight decrease	All	No	None	Yes	50	50
COLORADO.											
Los Pinos	.....	.....	150	None	.....	No school	No	None	Yes	50	50
DAKOTA.											
Devil's Lake	*29 †18	48	250	38	Same	⅙	No; if anything they are more apt.	None	Yes	60	40
Fort Berthold	*20 †2	....	250	105	100 per cent. increase	¼	No	... do	Yes; with the addition of good houses and small farms.	75	25
Red Cloud	.....	1	1,200	No school.	.....	No building	Aptness more than ordinary.	....do	Yes	.....	100
Sisseton	120	835	300	120	10 per cent. increase	120	Equally apt	... do	....do	75	25
Standing Rock	10	10	400	60	40 per cent. increase	15 per cent.	.....do	....do	....do	10	90
Yankton	a400 ‡45	....	500	225	34 more	⅗	Not materially	do	....do	25	75
IDAHO.											
Fort Hall	.....	.....	200	No school.	.....	No school	No	None	Yes; combined with habits of industry.	50	50
Lemhi	.....	.....	23	....do	.....	23	No experience	....do	Yes	40	60
Nez Percé	35	50	180	48	Same	27 per cent.	No	....do	Yes; with habits of industry.	100	.....

* Read. † Write. ‡ Read Dacota and English. *a* Read in English.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Number of Indians who can read and write.		Number of children of school age.	Number attending school.	Variation from attendance of last year.	Proportion of children who can be accommodated in school.	Do Indian children differ from whites or blacks of similar social status and surroundings in aptitude for education?	Is there any insuperable obstacle to eventual civilization of Indians through the education of their children?	Are schools and missionary work the shortest roads to Indian civilization?	Percentage of Indian subsistence supplied by—	
	In school.	Out of school.								Indians.	Gov't.
INDIAN TERRITORY.											
Cheyenne and Arapahoe	94	20	700	140	Same	20 per cent.	Equally apt	None	Yes	50	50
Kiowa and Comanche	25	10	521	75	do	do	No	do	do	18	82
Pawnee	85	35	400	120	5 per cent. increase	25 per cent.	do	do	do	25	75
Sac and Fox	46	118	250	85	Same	½	do	do	do	50	50
Wichita	50	20	200	117	Attendance more regular.	½	do	do	do	50	50
IOWA.											
Sac and Fox	40	20	65			67 per cent.	No	None	Yes	75	25
KANSAS.											
Pottawatomie	44	154	120	57		75 per cent.	No	None	Yes		
MICHIGAN.											
Mackinac	100	300	1,500	200	Slight increase	⅕	No	None	Yes	100	
MINNESOTA.											
Leech Lake	1?	39	429	33	33 per cent. increase	⅛	No	None	Yes		
Red Lake	15	5	475	43	43 per cent. increase	1/11	do	do	do	100	
White Earth	100	250	470	99		⅓	do	do	do	60	40
MONTANA.											
Blackfeet	4		800	87	33 per cent. increase	10 per cent.	Equally, if not more apt	None	Yes	75	25
Crow	12		1,200	100	33 per cent. increase	¼	No	do	do	50	50
Flathead	55	30	300	35	10 per cent. increase	1/6	do	do	do	97	3
Fort Peck	10			60		Not 1/10	do	do	Yes; with other civilizing influences.	10	90
NEBRASKA.											
Great Nemaha	55	76	62	58	25 per cent. increase	All	No	None	Yes	50	50
Omaha	32	45	200	110	43 per cent. increase	1/10	Not materially	do	do	100	

Santee	50	150	126	126	Same	All	No	do	do	75	25
Winnebago	75	100	572	110	40 per cent. increase	$\frac{2}{3}$	do	do	do	100	
NEVADA.											
Nevada (Pyramid Lake)	§20		77	23		All	No	None	Yes	90	10
Western Shoshone			600			No building	do	do	do	$87\frac{1}{2}$	$12\frac{1}{2}$
NEW MEXICO.											
Abiquiu									Yes	25	75
Navajo			4,000			Not $\frac{1}{100}$	No	None	do	95	5
NEW YORK.											
New York	800	963	1,425	1,162	Same	All	No	None	Yes	100	0
OREGON.											
Malheur	5	3	244	57	.857 decrease	$\frac{1}{2}$	No	None	Yes	75	25
Siletz	100	55	230	110	Slight increase	$\frac{1}{5}$	do	do	do	80	20
Umatilla	20	8	90	28	Same	$\frac{1}{5}$	do	do	do	95	5
Warm Springs	16	10	90	50	do	$\frac{1}{5}$	do	do	do	100	
UTAH.											
Uintah Valley	67		‖30	22		All	No	None	Yes	$66\frac{2}{3}$	$33\frac{1}{2}$
WASHINGTON.											
Colville	20	69	379	25	Same	$\frac{1}{6}$	No	None	Yes	100	
Neah Bay	18	6	225	34	do	$\frac{1}{4}$	Much more apt	do	do	100	
Puyallup, &c	13	17	200	30		$\frac{5}{6}$	No	do	do	100	
Quinaielt	14	0	60	30	100 per cent. increase	$\frac{1}{2}$	Not so apt	do	do	98	2
S'Kokomish	37	§8	150	70	100 per cent. increase	$\frac{1}{2}$	No	do	do	84	16
Tulalip	50	150	200	54	13 per cent. increase	$\frac{5}{9}$	do	do	do	100	0
WYOMING.											
Shoshone and Bannock		1	600	41	75 per cent. increase	$\frac{1}{26}$	No	None	Yes	$33\frac{1}{2}$	$66\frac{2}{3}$

§ Read; none write.

‖ On reservation.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Are school children more ready to engage in farming, herding, &c., than others?	With a sufficient No. of schools, instructors in farming, agricultural implements, domestic animals, &c., will Indians reach self-support in a few years?	Instructors in farming.			Proportion of adult male Indians supplied with agricultural implements.	Per cent. of increase or decrease in crops raised as compared with last year.	
			Number of.	Amount paid.	No. who could be profitably employed.		By Indians.	By white employés.
ARIZONA.								
Colorado River	Yes	Yes	1	$900	3	All with hoes, shovels, and axes.	¾ per cent. decrease from lack of seed and water.	Average.
Moquis Pueblo	do	do			1	All with hoes and spades.	Increase would have been great but for floods.	None raised.
Pima	do	Have always been self-supporting.	None needed			Government has supplied them with very few.	Small crops on account of lack of water.	
San Carlos	Experiment never been tried.	Yes	2	2,000	3	One-fifth with shovels	50 per cent. increase	None raised.
CALIFORNIA.								
Round Valley	Yes	Yes	2	1,560	6	None	10 per cent. decrease (from storms).	
COLORADO.								
Los Pinos	Yes	Yes	1	720	5	1 to Ouray only	150 per cent. increase	200 per cent.
DAKOTA.								
Devil's Lake	Yes	Yes	2	1,380	4	About one-half	25 per cent. increase	Same as last year.
Fort Berthold	do	do	1	800	1	Nearly all	100 per cent. increase	75 per cent. decrease.
Red Cloud	do	do			5		No crops raised	
Sisseton	do	do	1	700	3	About one-half	50 per cent. increase	
Standing Rock	do	do	1	800	4		40 per cent. increase	
Yankton	do	do	1	900	2	Not one-half	10 per cent. increase	10 per cent. increase.
IDAHO.								
Fort Hall	Not in my experience	Yes	2	1,520	4	One-twelfth with wagons and harness. One-sixth with other implements.	115 per cent. increase	12½ per cent. decrease.
Lemhi	No experience with school children.	do	2	1,620	4	None	About same	About same.
Nez Percé	Yes	Already self-supporting.	3	2,390	3	Nearly all	Only small increase on account of drought.	Small increase on account of drought.

INDIAN TERRITORY.								
Cheyenne and Arapahoe	Yes	Yes	2	1,720	10	5 per cent	50 per cent	None raised.
Kiowa and Comanche	do	do	2	1,260	.....	One-eighth	300 per cent. increase	Do.
Pawnee	do	do	2	1,100	4	One fourth	60 per cent. increase	Same.
Sac and Fox	do	do	3	.....	6	Very few	25 per cent. more than last year	Do.
Wichita	do	do	1	720	10	50 per cent	Large increase	
IOWA.								
Sac and Fox	Yes	Yes	1	600	1	One-fourth	About the same	
KANSAS.								
Pottawatomie		Yes	3	1,140	3	75 per cent	15 per cent. increase	Same.
MICHIGAN.								
Mackinac	Yes	Yes	....	.....	.....	One-third	10 per cent. increase	None raised.
MINNESOTA.								
Leech Lake	Yes	Yes	1	.....	2	.....	Large increase	
Red Lake	do	do	1	.....	5	Three-fourths	33 per cent. increase	Same.
White Earth	do	do	....	.....	3	Nearly all	800 per cent. increase	
MONTANA.								
Blackfeet	Yes	Yes	1	900	6	.....	75 per cent. increase by joint Indians.	labor of employés and
Crow	do	do	1	840	1 to 10	.....	First crops raised	Large increase.
Flathead	do	do	2	1,500	2	Three	30 per cent. increase	
Fort Peck	do	do	2	.....	Sev'l	.....	Gratifying success considering their very limited facilities.	
NEBRASKA.								
Great Nemaha	Yes	Yes	1	600	2	Four-fifths	25 per cent. increase	50 per cent. increase.
Omaha	do	do	2	945	2	.....	do	
Santee	do	do	1	720	1	One-half	do	
Winnebago	do	Already self-supporting.	....	.....	.....	Nearly all	40 per cent. increase	
NEVADA.								
Nevada	No experience	Yes	4	3,600	4	.....	20 per cent. increase	
Western Shoshone	do	do	1	1,200	4	Very few	First attempt this year. No	white employés.
NEW MEXICO.								
Abiquiu	No experience	Yes	...	.....	.....	.....	.....	
Navajo	All are so engaged	Virtually self-supporting.	1	700	.....	One-half (hoes and axes).	10 per cent. increase	

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Are school children more ready to engage in in farming, herding, &c., than others?	With a sufficient No. of schools, instructors in farming, agricultural implements, domestic animals, &c., will Indians reach self-support in a few years?	Instructors in farming.			Proportion of adult male Indians supplied with agricultural implements.	Per cent. of increase or decrease in crops raised as compared with last year.	
			Number of.	Amount paid.	No. who could be profitably employed.		By Indians.	By white employés.
NEW YORK.								
New York	Yes	Already self-supporting.	No	ne need	ed		10 per cent. increase	None raised
OREGON.								
Malheur	Yes	Yes	2	$1,000	6		Large crop planted, but destroyed by the military.	
Siletz	do	do	1	720	6	One-fourth	50 per cent. increase	None raised.
Umatilla	do	do	2	1,600	4	Nearly all	Larger area planted than ever before; destroyed during incursion of hostiles.	
Warm Springs	do	Many already self-supporting.	1	800	2	Four-fifths	40 per cent. increase	100 per cent. increase.
UTAH.								
Uintah Valley	Yes	Yes	2	1,400	2	Very few	200 per cent. increase	
WASHINGTON.								
Colville	Yes	Yes	1	900	3	Twenty-five	100 per cent. increase	
Neah Bay	do	do	1	720	3		do	30 per cent. increase.
Puyallup, &c	do	Already self-supporting.			3		On Puyallup Reservation 20 per cent. increase. On other four reservations 10 per cent. decrease.	
Quinaielt		Almost entirely so now.	1	720			300 per cent. increase	200 per cent. increase.
S'Kokomish	Yes	Yes, very soon	1	720	1	Five-sixths	About 10 per cent. increase	
Tulalip	do	With long and patient instruction.	2	1,260	10	One-fourth	Slight increase	Slight increase.
WYOMING.								
Shoshone and Bannock	Yes	Yes	1	700	5	One-twentieth	50 per cent. increase	None raised.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Effect upon Indians of present system of issuing rations.	Should it be continued or discontinued? If the latter, how soon?	Number of Indians brought under religious influence.	Proportion of adult male Indians—		Causes to which uneasiness is attributed.
				Inclined to be turbulent or discontented.	Number who are so at present time.	
ARIZONA.						
Colorado River	None issued		None	None	None	Lack of food.
Moquis Pueblo	Very few issued; no bad effect		do	Six	Six	Visit of General Crook's command to Oraibe village.
Pima	None issued		1,000	None hostile; about one-half total number discontented.		Scarcity of water, and encroachments of white settlers.
San Carlos	Very good	Should be continued or Indians will starve.			Very few	Insufficiency of supplies
CALIFORNIA.						
Round Valley	As now issued in payment for labor, very good.	Should be continued	All	None turbulent; two-thirds discontented.		Failure of government to fulfill its promises as to land, agricultural implements, and clothing.
COLORADO.						
Los Pinos	Bad	Should be discontinued as soon as they can be taught agriculture, &c.	None	None turbulent	Some discontented.	On account of squatters on their land.
DAKOTA.						
Devil's Lake	Better than the old way	Should gradually be discontinued as Indians are taught self-support.	250	None	None	
Fort Berthold	do	do	Few	10 per cent	10 per cent	Desire for a roving life.
Red Cloud		Continued until they become self-supporting.	None	Nearly all, until lately.		Unsettled state in which they have been kept by the government.
Sisseton	Retards self-support	Discontinued in two years	All	None	None	
Standing Rock	Urges them toward self-support.	Continued until they become self-supporting.	No estimate	One-tenth	One-tenth	Conflict of authority.
Yankton	Bad	Gradually discontinued	425			
IDAHO.						
Fort Hall	Effect of gratuitous issue bad.	Gradually discontinued		One hundred and seventy-five.	One hundred and seventy-five.	Natural perversity, and failure of government to furnish them with food.
Lemhi	Bad			20 per cent	None at the agency	Desire to change their locality.
Nez Percé	None issued		All	Ten	Ten	Unwillingness to give up old roving life.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Effect upon Indians of present system of issuing rations.	Should it be continued or discontinued? If the latter, how soon?	Number of Indians brought under religious influence.	Proportion of adult male Indians—		Causes to which uneasiness is attributed.
				Inclined to be turbulent or discontented.	Number who are so at present time.	
INDIAN TERRITORY.						
Cheyenne and Arapahoe	.....	Until all treaty stipulations are fulfilled.	All	.....	.....	No dissatisfaction exists, except at smallness of ration.
Kiowa and Comanche	Bad	Continued until they are taught self-support.	.....	One-eighth	One-eighth	Small rations, and the murder of two Comanches by military on 28th June.
Pawnee	A necessary evil	..... do	150	Very few	.....	Want of farming implements and cattle.
Sac and Fox	Very few issued	..... do	800	.....	.....	Failure of government to recognize their title to their lands; question of transfer to War Department, &c.
Wichita	Bad	Discontinued as soon as they become self-supporting.	All	.....	Many dissatisfied	
IOWA.						
Sac and Fox	None issued	.....	.....	.....	.....	
KANSAS.						
Pottawatomie	None issued	.....	All	.....	.....	
MICHIGAN.						
Mackinac	None issued	.....	3-fourths ..	.....	.....	
MINNESOTA.						
Leech Lake	Very few issued	.....	200	.....	.....	
Red Lake	None issued	.....	200	.....	.....	Some uneasiness on account of loss of "cash annuity."
White Earth	..... do	.....	All	.....	One-tenth discontented.	Want of means to carry on farming.
MONTANA.						
Blackfeet	Very good	Continued until they are taught self-support.	Very few ..	.....	.....	
Crow	.....	..... do	.....	.....	.....	Some fear of encroachments by whites.
Flathead	None issued	.....	All	.....	.....	
Fort Peck	Bad	Continued only until they are taught self-support.	.....	.....	.....	

NEBRASKA.						
Great Nemaha	None issued		All	25 per cent. discontented.		Intrusion and interference of white settlers.
Omaha	do					
Santee		Discontinued when other provision is made for sick and aged.	All	Many dissatisfied		Insecurity of land titles.
Winnebago	None issued		do			
NEVADA.						
Nevada	No bad effect					
Western Shoshone	Very few issued	Should be issued to all as a reward for loyalty to government during recent Indian troubles.		Many dissatisfied		government to fulfill treaty obligations.
NEW MEXICO.						
Abiquiu		Continued until they become self-supporting.		All discontented		Want of permanent home.
Navajo	Very few issued	Discontinued gradually				
NEW YORK.						
New York	None issued		All			
OREGON.						
Malheur	Good	Continued until they become self-supporting.	150	All	All	The present irregular war.
Siletz	None issued except to working-men and those who are helpless.		200	One	One	Defeat in re-election to head chieftainship.
Umatilla	None issued		250			
Warm Springs	do		350			
UTAH.						
Uintah Valley		Discontinued when they become self-supporting.				
WASHINGTON.						
Colville	None issued		3,013			Some uneasiness relative to uncertainty in regard to their land, and of the policy of the government toward them.
Neah Bay	Only issued as equivalent for work performed.					
Puyallup, &c			600		One-half uneasy	Fear of removal, anxiety about claims on reserves, &c.

Table showing status and progress of Indian tribes in civilization—Continued.

Name and location of agency.	Effect upon Indians of present system of issuing rations.	Should it be continued or discontinued? If the latter, how soon?	Number of Indians brought under religious influence.	Proportion of adult male Indians—		Causes to which uneasiness is attributed.
				Inclined to be turbulent or discontented.	Number who are so at present time.	
WASHINGTON—Continued.						
Quinaielt	None issued					
S'Kokomish	None issued except to sick and infirm.		500			
Tulalip	None issued		Nearly all.	5 per cent	5 per cent	Fear of removal to another reservation.
WYOMING.						
Shoshone and Bannock	Good	Continued until they become self-supporting.			Many discontented	

DEPARTMENT OF THE INTERIOR, OFFICE OF INDIAN AFEAIRS,
Washington, December 4, 1878.

Maj. CHARLES L. FLANAGAN,
Clerk Committee on Transfer of Indian Breauu:

I inclose herewith, for the use and information of the Joint Committee of Congress to consider the advisability of transferring the Indian Bureau to the War Department, an abstract of the views expressed by the Indians relative to the proposed transfer of the Indian Bureau to the War Department, it being a brief summing up of the views expressed by the Indians at their councils, given in their own words.

Very respectfully,

E. A. HAYT,
Commissioner.

Abstract of views expressed by the Indians relative to the proposed transfer of the Indian Bureau to the War Department.

At the councils held by the Indians on the various reservations to consider the question of their transfer to the War Department, about 96 per cent. expressed their preference for the continuance of the present policy of appointing agents for them from civil life, for the following reasons, *given in their own words:*

They are opposed to the transfer to the War Department because they have always lived well under the Interior Department, and their women and children have done well. They are afraid that what they have already done in the way of tilling their fields will be thrown away. The soldiers diseased their women, and were constantly interfering with them and their families in their camps, and so conducting themselves as to be a cause of abhorrence.

If the military were again likely to have control and possession of San Carlos Agency, the Indians would take their children in their arms and go to the mountains.

We believe the present policy to be for our best interests and advancement in farming operations and other civilized pursuits. We believe the Interior Department will do right by us, judging from the past.

The Army has been the cause of leading into warfare against the whites, and they fear if transferred it would again lead many from the road of peace they have fully adopted. They believe their own advancement and future prosperity, the virtue of their women, and the education and useful training of their children, will be best secured under the present management.

We desire to become citizens of the United States and, until our naturalization is effected, to remain under the Interior Department. (Winnebagoes.)

We object to the transfer because in times past some of our men were abused by the military, and our tribe became very much diseased through the intercourse of soldiers with our women, and our condition has been made worse by our contact with the Army.

We are making homes for ourselves and families, and we expect, in a short time, to be self-supporting; the present policy assures us by past experience that proper industry on our part will soon give us competency and independence. The effect of contact with the common soldier is demoralizing, and we look upon a transfer to the War Department as destructive of our highest hopes, and as dooming our children to a life of infamy. Nearly all of our people would leave the reservation rather than risk a repetition of our sad experience under military rule in former years. (Tule River, Cal.)

The troops torment us in many ways, and do not try to encourage a frail man as is done under our present system.

To attain civilization is hard for us; but we can reach it through the present teachings, and our children will be benefited thereby. Our present prosperity certainly shows considerable advancement.

The change scares me. I fear the guard-house and the strong, iron rules of the military. I do not want to be forced to leave this agency and a civilized life to go north among the renegade Indians.

I am prospering. The present system has been the means of many buildings, wagons and cattle being owned by Indians.

I am trying to live like a white man, and feel that I am steadily improving. I do not want an officer of the Army to be my agent. I do not want to take off my white man's clothes and let my hair grow long, to become an Indian again, and abandon my children to the chance of being a wanderer, as I once was. (Devil's Lake.)

Their children are being educated under the present system, and they are in a reasonably prosperous condition.

We are trying to get our land and pay for it. We have a blacksmith, carpenter, and miller. We can plow and plant, and we wish to build fences, and stables, and pens, and raise all we can.

The Santees have churches, and pray and go to church, and that is a good, quiet

way to live. I think, if we keep this way, in a few years the boys will grow up and have large farms to work.

I think a citizen is better to be with than a soldier, as I think their way of treating us is more mild and as much to the purpose. Soldiers are more harsh to the Indian than the civilians are.

Our past observation and experience teaches us that the presence of a military post in the immediate vicinity of our Indian camp is always attended with demoralization of Indian women, and is followed by diseases among them unknown before the presence of soldiers, and the diseases thus brought into our families are always attended with terrible and fatal results to our women and children.

Our young men are imprudent, and often violent and reckless, and the presence of soldiers always results in violence and broils among the young men, for which they are treated or punished harshly by military authority, leaving a feeling of bitterness which frequently results, years afterwards, in some violent transaction on their part in revenge of real or fancied wrong inflicted on them in this way.

The presence of a military camp in our midst always makes among our people a feeling of distrust and uncertainty, a feeling that we are constantly watched for the purpose of giving us a bad name, whereas with an agent not connected with the Army, we feel that our failings will be charitably dealt with. (Fort Peck.)

If we had advanced while the military had control of us as we have since the present policy was adopted, we would now be as much civilized as the Cherokees, and be able to attend to our own business. (Sac and Fox, Ind. T.)

Instead of soldiers we want plows, wagons, harness, hoes, rakes, and cradles. By good advice we avoided trouble last summer, when war was almost in our camp. By good advice we kept out of trouble this summer, when all was in trouble around us, and by good advice and counsel we will always get along; but force begets trouble, and a soldier would rather force his views with a gun than talk them with his mouth. (Pend D'Oreilles.)

The soldiers get too much whisky; they give it to the Indian, who gets drunk, fights, and kills.

We once had soldiers here and they ran after our women. One lieutenant took an Indian woman for a wife, and then left her. We do not want soldiers here.

We feel that we have been as well taken care of under the present system as we can expect, and far better than we can hope for under the tender mercies of the Army.

If you will give us Indian police to keep us straight, that is all we want; do not send us soldiers.

I am very fearful of the consequences which might result from having men educated in the science of war put in charge of us. The military man has been educated to fight. Fighting and cultivating the soil are two different things, and while a military man may be able to do both, there is a possibility of his preferring to fight when there is no necessity for it. Education is in our midst. Our children are being educated. Their minds are being improved. I hold the plow, and am getting quite expert. The hoe also is in my hand. This reservation has had some experience with military men. We have had two military men as agents. Their conduct did not impress us favorably. The progress of the Indian was the least of their troubles, for they had a personal dignity to sustain. They had no time to look after the welfare of the Indian; they had enough to do to keep their buttons bright. (White Earth, Minn.)

We have no fault to find with the Indian Bureau in the management of our affairs in the past. Our treaties with the United States have been faithfully kept. Our annuities have been honestly paid. Our people have been aided and encouraged by our agents in the education of our children, as well as in farming and general advancement in civilization. We want a separate Indian Department, having exclusive jurisdiction over Indian affairs, willing in the future as in the past to listen to our grievances and represent our desires to other departments of the government. We wish the Indian Bureau to stand between us and the War Department, so that if unjust complaints are made against Indians for any cause, such complaints may be carefully investigated and peaceably adjusted before the services of the Army of the United States shall be called into requisition. We do not believe that the presence of soldiers at the Indian agencies would improve the Indians in habits of morality, temperance, and industry, or advance their civilization, but the contrary.

We very much fear that the proposed transfer would prove disastrous to the red men—that as a step in the dark it would be at least a hazardous and dangerous experiment. We are unable to see that any good to our race would be likely to result from it. We regard it with intense aversion, as fraught with evil, injustice, and cruelty. (Indian of New York.)

About 4 per cent. of the whole number of Indians represented in the councils expressed themselves in favor of the transfer for the following reasons, given in their own words:

Because if they have a military man he will hunt up their horses if they are stolen.

We will get our annuities in cash; now a part is used for other purposes. The chiefs will then know what is done with the funds.

Want to try a new plan; are getting along very well now, but would like to try a new plan.

Have commenced to work since the soldiers have been here. We were always in trouble with civilian agents.

The government bought our land from us, and for some time paid us money every year, but now they make us work for it. Now our Great Father buys cattle, horses, and farm-implements with our money without our consent.

We used to get our annuity goods and supplies given to us all on a pile, and now they are weighed or counted out to us, a few pounds at a time. We want the old way again. Formerly when we had any business with the Great Father we went to Washington and he would hear our word; now we have to do business with the agent. Therefore we want to try another department of the government.

I want the military to buy all our supplies and spend all our money for us; they always buy cheaper than civil agents. I do not want schools and employés; it takes a large share of our appropriation, and I want it all to be expended in provisions and goods.

I want the military to take charge of us so that our Indian notions would be tolerated. I do not care for wagons and plows; I want the free life of a playing and dancing Indian.

We have no hard feeling against our agent, but the whites surrounding us seem to hate us. We thought whites would think better of us for rendering assistance to whites during the late hostilities, but our treatment has been worse and may continue so. I wish to have the soldiers take charge of my people, and speak for many Kamiah Indians. (Nez Percé.)

TESTIMONY

TAKEN BY THE

JOINT COMMITTEE ON TRANSFER OF THE INDIAN BUREAU.

LINDELL HOTEL, SAINT LOUIS, MO.,
September 26, 1878—7 o'clock p. m.

ALFRED L. RIGGS sworn and examined.

The CHAIRMAN. The object of this commission is to gather such information as will bear upon the subject of the transfer of the Indian Bureau from the Interior to the War Department. Whatever information you can give us bearing upon that point we would be glad to receive. We wish to learn what you have done, to some extent, with your Indians; and what you think can be done in the future, and your opinion as to whether it would be advantageous or not to make this change. You have had long experience with the Indians, as I am aware, and you can state to the committee your views upon this subject, in as brief a manner as possible, and, at the same time, your reasons for entertaining such views.

INDIANS DESIRE INDIVIDUAL TITLE TO THEIR LANDS.

The WITNESS. My present knowledge is chiefly confined to the various bands of the Dakotas or Sioux, and I know that they are capable of civilization. They have made great advances in that direction, especially in the last ten years. There are, at the Santee Agency, where I am located, 850, who have been anxious for civilization and individual title to their lands for the last eight years. A colony which numbers nearly 400, now located at Flandreau Agency, are citizens and homesteaders. They left their annuities and what the government had already given them in order to get away from the bondage of the agency, and to become and live as independent men. At the Sisseton Agency—another branch of the Sioux—they are anxiously waiting for citizenship, liberty, and individual rights, and they are so impatient for it that a colony of 150 went out last year, all taking homesteads, to the south of the agency, leaving a great many advantages, such as stock and implements that the government had already given them. Over on the Missouri, the Indians from the Cheyenne River Agency have located on the east side a colony of probably over 200. They are not all of them dressed in citizens' clothes—part of them still have their blankets; but they are exceedingly anxious to be independent of their tribal relations and become men. They have only been started some four years, and have shown the same disposition in coming from one of the recently military tribes. They are perfectly independent of the general disposition of those heretofore intractable people, and are ready for civilization. The Yanktons have also, about one-third of them, adopted the habits of civilization. So that, all around the field, throughout the Dakota

nation—which some say is one of the worst specimens, so far as civilization is concerned—there is this hopeful outlook and desire for progress and civil rights, especially for protection and the help of the law. That being the case, we feel very strongly that it is only right that they should be helped forward in this direction, rather than left merely helpless. The Army have been very useful as helping on with this civilization, but we do not feel that they are the men to carry it on; that the Indians rather need the advantages of regular courts and the regular institutions of our civil society. Our Indians are also ready to take all the burdens of taxation, and where they have been taxed they have never shrunk from it, but have readily and willingly paid taxes, understanding that it was a part of the burden that had to be borne in return for the privileges that the government gave them.

INDIANS OBJECT TO THE TRANSFER—INTEMPERANCE IN THE ARMY.

Question. Do your Indians understand that this question is now being discussed by Congress and the people of the country?—Answer. Yes, sir; it has been talked of among them a good deal. It was talked of in their town council a few weeks ago; and one of the councilors said that it seemed to him to be a clear case. The idea was that the Indians were to be educated in civilization; but he found that the Army men had certain habits which he did not think were exactly in the line of civilization. For instance, they can do a great deal of injury by example, being largely privileged to drink, and he thought that that did not qualify them to be the best preceptors of Indians; that the country at large would not care to have the Indians taught to drink. That is their idea.

Q. Are they afraid of the Army people—fearful that the Army would impose upon them more than other people?—A. No, sir; I do not think they are. In fact, they are generally on very good terms with the Army men, as indeed we are; some of whom are among our best friends; but then they recognize that the Army have a certain function, which is to keep order, and, so far, they look upon them as their useful helpers, but they are impressed with the idea that the Army is not acquainted with all the arts of civilized life. Even among the military tribes at the Red Cloud Agency is found this same spirit.

EDUCATION AND MORTALITY AMONG THE INDIANS.

Q. Do the Indians take readily to education—are they willing to be educated in the English branches, such as we get in schools? You have difficulty, I take it, in starting them, but after a while how do they feel about it?—A. Yes, sir; we have a little difficulty in the start; that is, they have this idea, that it is a favor to us for them to go to school, and when they first start they ask to be paid for going. Pretty soon they understand that it is a favor to them, and then, after a while they are even ready to do something to support the children that are in the schools.

Q. Are your Indians increasing or decreasing in numbers, year by year; I mean the tribe that you are with?—A. They are on a stand-still. It is very had to say whether they are increasing or decreasing. They have lost so many by this exodus of homesteaders; in the last ten years we have lost 300, that have gone out as homesteaders, over to the east of us. The impression is, according to the best statistics that we have on the agency, that there is no loss other than that. It is now increasing, because when they change their manner of living there is a slight decrease, and in some instances considerable decrease; but we find as soon as the first effect of the change of living has passed that there is then an increase.

By Mr. McCREERY:

Q. Where do you live now?—A. Santee Agency, Nebraska.

Q. How long have you been there?—A. I have been there over eight years.

Q. Have you been acting as Indian Agent?—A. No, sir; as a missionary under the American Board, and superintendent of their training-school at that place. I have a school of over 100; about one-half of them are boarding-scholars. I have classes in algebra, book-keeping, history, geography, and all the common branches.

COMPLAINTS ON THE PART OF THE INDIANS.

Q. Have there been many complaints on the part of the Indians as to the action of the agent in paying out appropriations?—A. No, sir; not recently. We have had no trouble on that account lately.

Q. How long since was their trouble on that account?—A. It is some nine years since there was any particular trouble in that direction.

Q. What was the trouble then?—A. There was supposed to be a misappropriation of funds.

Q. An embezzlement of funds?—A. Yes, sir; supposed to be.

Q. Since that time there has been no complaint?—A. No, sir; our agency recently has been managed quite efficiently generally, with the exception that it has been almost always lacking in the execution of justice on account of there being no statute law to govern the Indians.

LOCAL GOVERNMENT OF THE INDIANS.

By the CHAIRMAN:

Q. Are your Indians governed now as the military tribes—as we might call them—are, by chiefs; or have you adopted any course looking to civilization among your people?—A. The chiefs have been dispensed with, and they now elect four councilors every year, who hold two years, making a board of eight. These have duties similar to county supervisors, or township councilors—something of that character. But the real government of the agency is in the hands of the agent and these police; these are rather advisory. It would be a great advantage if all our agencies were under law, and the agents were made justices of the peace.

Q. You think your Indians are so far advanced in the knowledge of civilization that they would be willing to have the laws extended over them as they are over the whites?—A. At the Santee Agency they have been petitioning for that for the last eight years, of their own motion; and all these Indians that I have spoken of as being instances of success in civilization are ready for it.

INTEMPERANCE IN THE ARMY.

By Mr. McCREERY:

Q. I suppose you did not mean to state, a while ago, that the Army would give instructions in drinking—you didn't mean to state that that would be a branch that would be taught by the Army?—A. I gave the Indians' speech; and Indians learn a great deal more by example than by precept.

By Mr. STEWART:

Q. I understood Mr. Riggs to say that the Indians among themselves thought that was one of the objections—that this chief objected on the grounds of the pernicious example.—A. That is the point I meant to make.

Q. I thought Senator McCreery meant that you had given that as your own version.—A. O, no, sir.

By Mr. BOONE:

Q. You are a teacher?—A. Yes, sir.

Q. Who employed you as a teacher?—A. The American Board of Foreign Missions.

Q. An Indian agent has nothing to do with that?—A. No, sir.

INSTRUCTION OF THE INDIANS.

Q. What has the Indian agent to do with instructing the Indians, either in literature, agriculture, or anything else?—A. The government supports a boarding-school, which is under the charge of the agent. He also has a number of apprentices in the shops—the blacksmith-shop, the carpenter-shop, the mills, and farming, for instance. Our blacksmith there is a full-blood Dakota Indian. He served his term under the government blacksmith, and now there is no government blacksmith, but this Dakota has the position of blacksmith, and has apprentices.

Q. These apprentices you speak of are appointees of the agent?—A. Yes, sir.

Q. Do you say the Indians are afraid that if an Army officer should be agent he would change this arrangement and appoint worse men?—A. That is their impression.

Q. How do they get that impression; do you know?—A. I cannot say. I do not think anything has been said to them about it.

EFFECT ON THE INDIANS OF ASSOCIATION WITH THE ARMY.

Q. Are there any troops near your agency?—A. The neaest regularly stationed troops are at Fort Randall, which is about fifty miles off. We have no need of troops.

Q. Do the soldiers visit your agency?—A. No; excepting the government inspecting officer.

Q. Do you know anything about the intercourse of the Indians, generally, with the troops at Fort Randall?—A. In what respect?

Q. In any respect. Do they associate with the Indians, and what is their influence over them, of your own knowledge?—A. At present their influence is rather to unsettle the Indians in their confidence in the agents.

Q. In what respect?—A. In hoarding complaints and encouraging discontented spirits.

Q. Discontent about what?—A. In regard to the administration of affairs. If there is any man that is hauled up for a supposed misdemeanor, he is very apt to carry the case by appeal to the colonel commanding at the fort.

Q. Is that due to the influence of the Army officers?—A. It is in the present case—not necessarily so; but it is in the present case.

Q. How do you know that?—A. Because the Indians are like other people; they have parties, and there are some of them who are working in that case for the appointment of a certain Army officer as agent.

Q. There is a rivalry between two parties?—A. Yes, sir.

Q. Who is Indian agent at your agency now?—A. Mr. Lightner.

Q. How long has he been there?—A. A year and a half.

Q. His administration, you say, is satisfactory?—A. At present it is.

Q. Has it always been so?—A. When he came there he knew nothing about the business. It takes a man several years, or at least a year, to learn; and hence the first year he is not good for much.

Q. What were the complaints against him the first year?—A. No complaint, except that he was not acquainted with the business.

Q. Since then, how has it been?—A. His efficiency has increased.

QUALIFICATIONS OF INDIAN AGENTS.

Q. When you talk about the efficiency of an Indian agent, what do you mean? What does he have to do?—A. He has to make the proper issues at the right time and of the right kind. He has to encourage the Indians to work, use the proper means to set them to work at the proper period and in the right way; and by a general supervision of the people in his employ make every one work; and it is his duty to do all he can to secure and maintain justice and order in the agency.

Q. Has there been any complaint about his disbursements of the funds?—A. No, sir; nothing. He has been strictly honest.

SCHOOL ATTENDANCE AMONG THE CHILDREN.

Q. I am glad to hear that. How many Indian children are there at your agency?—A. Under the age of sixteen, I think there are 125 or 130—that is, within the school age.

Q. Within the school age?—A. Yes, sir.

Q. At that age you have about 100 at school?—A. There are other schools besides mine, and my school draws in from other agencies, and also includes a number of Indian men.

Q. What proportion of that 125 Indian children go to school?—A. Four-fifths of them. They are not in the school the whole of the year.

Q. What is the average attendance, in your opinion, in the schools there?—A. I should say that it was over 100. Bear in mind that it includes those over what is called the school age.

Q. I mean the children within the school age.—A. The school age is between six and sixteen.

Q. Between the ages of six and sixteen what is the average attendance out of the 125 I understood you to say were of the school age?—A. My impression is that of that 125 there are 50 in the school the larger part of the year; and that there are 50 in as much as two and three months.

Q. Do you teach the school all the year, or how long?—A. All the boarding-schools are kept ten and eleven months in the year, but the day-schools are not kept so long.

TEMPERANCE IN THE ARMY.

Q. You spoke a while ago of the pernicious example of the Army officers in this, that the Indians thought they drank too much?—A. Yes, sir.

Q. Is that the case with those that have associated with the Indians on the reserve you have been connected with?—A. We have not, as I stated, very much to do with the Army. There is only occasionally a visit from an Army officer, who comes down to inspect supplies.

Q. What has been your observation upon this point: Have the Army officers, when they have been down there in the capacity of inspectors, or otherwise, been under the influence of liquor, and what has been their conduct?—A. No, sir; I understand generally that an Army officer, when he is on duty, keeps himself rather straight; but it is within the knowledge of the Indians that the Army officers do indulge more than any other class in the use of liquor.

Q. You mean that is what they think about it?—A. Yes, sir; and that is what I think about it. If you please, I would like to add to the state-

ment in regard to civilization that we feel that the necessities of the Indians require a change—rather an advance than a backward movement. We do not feel that the execution of the Indian affairs is up to the progress of the Indians.

DESIRE FOR A PERMANENT FORM OF GOVERNMENT.

Q. Upon that subject I would like to ask this question: What do you think of the feasibility or practicability of establishing a permanent form of government over the Indian tribes?—A. It is feasible and practicable.

Q. Do they desire it?—A. Generally. The wilder tribes do not.

Q. I mean those who are more civilized.—A. Those who have got the genius of civilization, who have an idea of what civilization is, at once desire it and demand it. The Indians are really ahead of us. They are ready to do more than we have faith to believe that they are able to do in the way of civilization.

Q. Would they be willing, in your opinion, to surrender their tribal governments for a form of government instituted by the United States?—A. They would be more than willing. The tribal government in most cases is either a military despotism or a fiction.

Q. And you think that is not satisfactory to those that are advanced in civilization?—A. It is satisfactory to none who have a desire to become civilized, not only to those who are advanced, but to those who have the first impulse to begin. They want to walk out of it at once.

Q. And your opinion is, if I understand you, that the great preponderance of that tribe with which you are familiar is in favor of this advanced movement?—A. Yes, sir; and not only with those, but I speak of the whole Sioux Nation.

Q. You are acquainted with them?—A. So far as they have an appreciation of what civilization is, they are ready at once to go into that state of allegiance to the laws of the United States.

CAUSES FOR OBJECTING TO THE TRANSFER.

By Mr. STEWART:

Q. In what respect would this progressive movement be retarded by the transfer of the bureau to the War Department? Not what you regard, but why do the Indians object to the transfer? So far as you have heard from them, do they regard that as a badge of servitude, or would they regard the employment of Army officers over them as tending to degradation?—A. No; I think not that. I have had very little conversation with them on that point.

Q. What are the views of your Indians in regard to the transfer?—A. Generally against it.

Q. Why do they object to it?—A. They look upon the military as having the function of soldiers, and as not having had in their training instruction in the arts or in civil law.

Q. Then they regard that as rather tending to degrade than to elevate them?—A. Yes, sir; so far as this—if they feel that they are under the military, they are in a state with no future to it.

Q. That is the point I want to get at, whether the Indians reason the matter out in their own minds?—A. Yes, sir; that is the impression, as far as I am able to discover—if they are to be under the military, that they are to be in a certain condition forever.

Q. This condition, then, that you say they all aspire to, namely, citizenship, they feel that they cannot attain as readily under the military as under the civil rule?—A. That is it.

QUALIFICATIONS OF CIVIL AND MILITARY AGENTS.

By Mr. BOONE:

Q. What would be the difference, in your opinion—I am not talking about what the Indians think would be the difference—but what, in your opinion, would be the difference in their advancement between a military officer being there as the agent to disburse the funds that are given by the government and to oversee the general management of the Indians, and a civilian's being there for the same purpose? In other words, does it follow as a matter of course that because a man is an Army officer he is less qualified to attend to those duties than if taken from civil life?—A. In this way: He has a particular training; he may be, in spite of his training, the very best man for the work; but, other things being equal, he is not, on account of his training, the best man for this work, because he has a special training in another and entirely different line. Although some of the most successful agents have been ministers, still some of the Army officers that we could pick out would be the very best agents that could be found; but the fact is that the men we would want to pick out of the Army for their efficiency are the men the Army cannot afford to spare.

Q. Well, why not?—A. Because the Army has to exist, and it needs its best men in order to exist. It cannot get along without efficient men any better than any other organization. And by what I have said against the Army, as to its administration of civil government, I would not be understood as implying any hostility to it; it has had a very useful function, still has, and will continue to have.

Q. Your opinion is simply that from the training necessarily, or rather naturally, of an Army officer, he is therefore disqualified to a certain extent from administering civil affairs?—A. Yes, sir; and, furthermore, that in order to do justice to the Indians we must acknowledge the true idea of what we ought to do for them, and not conceive it to be a mere matter of disbursing supplies.

Q. I agree with you as to that.—A. It has in time past been too much a mere matter of disbursing supplies.

Q. I think that is very likely. I think, in other words, that we have misunderstood the capacity of the Indians for improvement.—A. No question about that.

By Mr. STEWART:

Q. Have we not made a greater mistake in sending men not posted in Indian affairs, instead of sending men familiar with the details of the work? You speak of agents requiring a year's experience and intercourse with the Indians. Now, if you selected men familiar with their habits and modes of life, would not that have done away with most of the charges of inefficiency against the agents?—A. We need men thoroughly posted in Indian affairs; the agents are not trusted enough.

Q. Some of them too much, perhaps?—A. They ought to be men who can be trusted.

Q. Has it not been too much of a political movement in these appointments?—A. Maybe; I do not understand much about politics.

Q. I mean by political movements in these matters the selection of men not because of their efficiency or knowledge of Indian affairs, but because of the fact that they are good political wire-pullers.—A. I am not much of a politician myself; I do not think we have many wire-pullers in that respect.

RELIGIOUS INSTRUCTION OF THE INDIANS.

By Mr. BOONE:

Q. What religious denomination has charge of your agency?—A. The Quakers.

Q. "Friends," as they call themselves?—A. Yes, sir; the Hicksite branch.

Q. Are any other denominations permitted under the present policy to send missionaries and teachers on that reservation?—A. If any missions are established they are allowed to remain, but they are not allowed to open new missions except where they have the nominations of agents.

By Mr. MCCREERY:

Q. How long have the Quakers managed that agency?—A. Something over nine years.

THE COMMISSIONER OF INDIAN AFFAIRS SHOULD BE A CABINET OFFICER.

By the CHAIRMAN:

Q. If there are any other statements that you desire to make, you will be permitted to go on and make them. We want to be as explicit as possible. We do not wish to abridge what you wish to state; at the same time, we would be pleased to have you make it as brief as possible.—A. I have nothing further, that I know of, to state, except that this impression is growing stronger every day, that in order to meet the necessities of our Indian tribes we ought to have an enlargement in the bureau that takes charge of them; we ought to have an enlargement of its powers; and really nothing less than an independent department is capable of attending properly to its affairs. That is the impression that is growing every day among those that are interested in the work on the frontier.

By Mr. BOONE:

Q. You mean, make the Commissioner of Indian Affairs a Cabinet officer?—A. Yes, sir.

S. W. MARSTON, D. D., sworn and examined.

By the CHAIRMAN:

Question. You were here when I made the statement to the former witness as to the character of the evidence we are seeking?—Answer. Yes, sir; I heard the remarks.

Q. The law requires us to take such evidence as will bear upon the question of the transfer of the Indian Bureau from the Interior to the War Department; whether it would be better for the Indians and for the government, or for both, to make such transfer. Any information you can give the committee in reference to the feasibility of such a course will be gladly received.—A. I am not very much acquainted with the Indians of the country outside of the five civilized tribes.

Q. How long have you been with them?—A. I have been with them more or less for seven or eight years, but as agent for little more than two years.

CONDITION OF THE FIVE CIVILIZED TRIBES OF THE INDIAN TERRITORY AND THEIR PROPERTY RIGHTS.

Q. That is, with the five civilized tribes?—A. Yes, sir; the five civilized tribes, composed of the Cherokees, Creeks, Choctaws, Chickasaws,

and Seminoles, numbering in all about 57,000. They are really civilized and christianized, and are quite industrious in their habits, and as upright and honorable in their dealings, and about as sharp in trade, as white men generally are. They have their farms, their gardens, their cattle, their churches, school-houses, court-houses, and council-houses, and each tribe has its own form of government, resembling very much the Government of the United States.

Q. These tribes still hold their property in their tribal relations—that is, not in severalty; it is all together?—A. All together; with each tribe.

Q. Are they posted as to the movement on the part of the government at this time in reference to this subject of the transfer of the Indian Bureau?—A. I think they are somewhat posted. We have four weekly papers published, and I notice in these papers that the question has been discussed considerably of late.

INDIANS OPPOSED TO THE TRANSFER.

Q. What, so far as you know, do they have to say about it? Of course that would not have much to do with the committee, but we would like to know how they feel upon this subject; whether they look upon it with favor or as damaging to them.—A. So far as I have any personal knowledge of their views on this matter, they seem to be opposed to it.

Q. They have troops in that part of the country, I suppose?—A. Yes, sir; at Fort Gibson, which is in the Cherokee Nation, about eleven miles from where the agency was.

INFLUENCE ON THE INDIANS OF ASSOCIATION WITH THE ARMY.

Q. So far as you know, what has been the influence, morally speaking, of the troops that were located near the Indians; has it been to degrade or lower either, or has it had an elevating influence?—A. They have had three changes in that command in the last two years, and while I was there I knew of nothing damaging to the administration of the military so far as they have had the exercise of any authority. The present commander is one of the noblest Christian men I ever met with, and has had a good influence—Major Leighton. The only use we have for the military is to assist in the removal of intruders who object to leaving the country on being duly notified.

Q. You have also got a number of what we call freedmen in your part of the country?—A. We have among the five tribes between 5,000 and 6,000 freedmen.

Q. Are they also making some progress towards civilization?—A. They seem to be; they are more industrious, perhaps, on the whole, than the Indians, and some of them are accumulating large property. Among the Cherokees and Creeks, the freedmen are citizens of the tribes; among the Choctaws and Chickasaws, they are not.

Q. If I understand you, then, you think it would not advance the cause any by making a change, and turning them over to the War Department from the civil management?—A. I think it would not, with these five tribes. I think they would make better citizens of the United States, or at least they are well qualified.

INDIANS' IDEA OF THE RESULT OF THE TRANSFER.

By Mr. BOONE:

Q. Is it the understanding among the Indians that the transfer of the management of the Indian affairs from the Interior to the War Depart-

ment turns the Indians over to the management of the Army?—A. That seems to be the general impression.

Q. That is not your opinion, is it?—A. No, sir; not with a view to exercise any undue warlike authority over them.

PREPARED FOR CITIZENSHIP.

Q. Now, you stated awhile ago that they preferred, or at least were better qualified, to be citizens of the United States than to be turned over to the War Department. I do not understand what you mean by that.—A. I meant to say that they were well qualified, so far as intelligence, morality, and Christianity are concerned, to become citizens of the United States.

Q. Do you think it would retard them in that respect by transferring the management of their affairs to the War Department?—A. I am not aware that it would. I am not sure of that.

Q. The duties of an Indian agent are more fiscal than otherwise, having to do with the disbursement of their funds, &c.?—A. Yes, sir; though the duties of the agent at that agency, I suppose, were very different from the duties of an agent at most of the other agencies. He had the supplies to issue, and a large part of the office work—correspondence with the Indians—to attend to. Sometimes I would get twenty letters a day from the Indians.

Q. Any man, no difference whether an Army officer or civilian, so long as he is honest and accurate, could attend to these duties, could he not? I mean, everything else being equal, there is no difference between an Army officer and a civilian in respect to the performance of these duties?—A. Any man understanding their wants, and having their interest and welfare at heart, might be able to do it.

WHY THE INDIANS OBJECT TO THE TRANSFER.

Q. So that if any man would attend properly to his duty, there is really nothing in the fact of the bureau being under the control of one department or the other, so far as the simply clerical duties of an agent are concerned, is there, in your opinion?—A. I should think not; but there would be in the opinion of the Indians—that is, in the opinion which they now hold.

Q. How did they get that opinion?—A. I received a telegram yesterday from the chief of the Cherokee Nation that might explain that.

Q. I would like to know what it is.—A. I will introduce it, if you have no objection, right at this point.

[Copy of telegram.]

MUSKOGEE, IND. TER.,
September 25, 1878.

SIR: Our national council passed the following preamble and resolution to-day:

Whereas strenuous exertions are being made by the enemies and mistaken friends of the Indians, to transfer the Indian Bureau to the War Department; and

Whereas our condition as a people has always improved under the peace policy and has always retrograded under a war policy; and

Whereas the idea of being forced to have communication with the United States only through a department whose name is suggestive of subjugation, is repugnant to the Indian race: Therefore,

Be it resolved by the national council of the Muskogee Nation, That in the name of the Creek people we most emphatically protest against such transfer.

WARD COACHMAN,
Principal Chief.

To Hon. S. W. MARSTON,
Lindell Hotel, Saint Louis, Mo.

Q. I understand from that that the chief objection of this people is

the idea that because a man belongs to the Army he is in favor of subjugation?—A. That seems to be the idea in the dispatch.

Q. How long did you say you had been in that country?—A. I have been there since June, 1876, permanently located there.

NO AGENT FOR THE FIVE CIVILIZED TRIBES.

Q. You were an agent?—A. Yes, sir; I was an agent two years and one month.

Q. Do you hold that position now?—A. I am the late Indian agent of the late union Indian agency.

Q. You mean the agency which was abolished?—A. Yes, sir; it was abolished by Congress. There is no agent there now.

Q. They do not need any there, do they?—A. Yes, sir; they need an agent, and ought to have one.

Q. Do you know why it was abolished?—A. On the score of economy, I suppose.

Q. Has it been consolidated with some other agency?—A. I think about three years ago there were three agencies consolidated into one. The Cherokees had an agent of their own, the Creeks and Seminoles had an agent, and the Choctaws and Chickasaws had an agent.

Q. The Cherokees have good schools, have they not?—A. They all have good schools.

Q. They have a common-school system of education, have they not?—A. Yes, sir; where all the children have the privileges of the schools.

Q. I believe they have some high schools?—A. Yes, sir; they have their high schools, and their male and female seminaries, and their manual-labor schools. The school system among these Indians is perhaps as good as in any State of the Union, and they have a large school-fund for their support.

Q. Who is the agent of this consolidated agency now?—A. They have no agent. I was the last agent.

Q. What need have they of an agent?—A. As the medium between them and the government, and to settle their civil difficulties—difficulties that occur between the Indians and the white men.

WANT OF COURTS OF COMPETENT JURISDICTION AMONG THE INDIANS.

Q. Have they no courts?—A. None that reach the white men. I have had as high as fourteen cases in one day, in the office, little petty difficulties between the Indians and the white men, to be adjusted. I generally brought about as favorable a compromise as I could, as I had no law to enforce any decisions I might make.

Q. From your experience there—you are a man of some age and considerable experience—outside of this idea that the Indians entertain against the military men, do you know of any valid objection to transferring the Indian Bureau from the Interior to the War Department? If there is any reason in your judgment, or any facts that you are in possession of, we would like to know them.—A. I have no facts bearing upon the question—nothing but the general idea that these Indians are far enough advanced in civilization and christianization to get along with any man for an agent, provided he is a good man, whether he be an Army officer or civilian. I received a letter to-day from an old missionary of the Creek Nation which I would like to have read and introduced as a part of the record.

EUFAULA, CREEK NATION, *September* 24, 1878.

MY DEAR BROTHER: You wish me to give you my views from a missionary standpoint, in reference to the present effort on the part of many to *transfer the Indian Bureau to the War Department.*

I will do this candidly; and it is well you request me to write "from a missionary standpoint," for I have long ago shaken hands with politics, as we were mutually tired of each other, and have never voted outside of a Masonic lodge or Baptist church since I cast my vote for Henry Clay.

While I give my views candidly, I must also give them carefully; for I know not into whose hands I may fall, and the great desire of my life is to be let alone as a missionary in this field where I have spent the prime and best energies of my life, and where I wish my friends to bury my bones. I do not wish to be regarded as the enemy of any department of our government.

A most solemn and important question now addresses itself to the Congressional committee convened in Saint Louis, and to the American people, whose servants they are, the answer to which is full of responsibility. This responsibility, to which I refer, is what our great nation owes to the Indians, to itself, and to its future character in all time to come.

In our dealings with the Indians, policy, or an apparent necessity, should not stifle the claims of humanity or of justice. An opportunity is now offered to the people of the United States to give an example of the triumph of liberal principles over that sordid selfishness which has been the fruitful cause of so many Indian wars and woes.

As a missionary, I am not fully in accord with all the advocates of the peace policy, nor yet with those who favor the transfer of the Indian Bureau to the War Department. If I have to choose between the two, I greatly prefer the present peace policy, and for the following reasons:

First. The Indians themselves with no exception, that has come under my observation, are opposed to the transfer of the Indian Bureau to the War Department. I think I can safely say that I have traveled more among the Creeks than any other man, and that I have had a better opportunity of reaching the masses; and though I have never made it a point to find out the views of the Indians, yet I have had favorable opportunities of hearing them talk about this matter, and all who have expressed their views have opposed the transfer. There are some white men favorable to the transfer, but no Indians with whom I am acquainted. The Indians are not opposed to the War Department from any desire of an opportunity to be insubordinate, or from any hostile feelings toward our government, but because soldiers as a rule demoralize the Indians where they are stationed, and greatly increase the number of those Indian women who learned in Jackson's war to sell their virtue for bread. I might give this as another reason for opposing the transfer, viz:

Second. I oppose the transfer to the War Department because soldiers, above all other people, corrupt the Indian women where they are stationed or among the tribes with which they go to war.

This is not because they are by nature worse than other men, but it arises from circumstances connected with their profession as soldiers. They either have no wives or else they live apart from them; and they are not allowed to carry concubines with their canteens; hence, as they are but men, when they are stationed among Indians, or capture them in war, the women who are defenseless are made a prey to their lusts, the domestic happiness of many a home is destroyed, and the youths who are to be the citizens and counselors of the next generation are corrupted. This is a true picture, and yet too dark to contemplate. I challenge history or accredited tradition to name one woman of easy virtue among the Creeks before the war of 1812-'14. Jackson's soldiers were the first men in the world to teach the Creeks adultery and fornication. And their women were forced to this to get bread for themselves and for their children after their warrior husbands had fallen facing their foes at the battle of the Horseshoe.

Third. I am opposed to the transfer because not only private soldiers, but generals of the Army also, have been accustomed to deal unfairly with the Indians.

If I select as an example as good and as honest a general as we have ever had since Washington, I think it will answer. Without trespassing more on your time long enough to cite other instances, I refer you to page 580 of "Indian Treaties," published at Washington City A. D., 1826, as proof that General Jackson did, in behalf of the United States, bribe the Colberts and other leading Indians to sign the treaty with the Chickasaw Indians of October 19, 1818. In his letter to the Secretary of War, J. C. Calhoun, General Jackson says: "We can assure you that without this *douceur* we could not have obtained the treaty, and we have placed the land reserved in a better state for the benefit of society, and the individual advancing the amount is willing to retain it, if the Executive shall think proper to make that election. *You will perceive by the transaction we created a fund out of their own property to bring over the influence of the nation and obtain this cession so important to the United States and the western world;* for the strength of the population of the country ceded will be sufficient for the defense of the West in the event of war in that country, and the report of Major Lewis will show its extent and immense value."

The context shows plainly that by this "*douceur*" General Jackson alluded to a bribe by which he had induced a few leading men to treat away lands which belonged alike

to all the Chickasaws. This is only a specimen of the military policy. Georgia and other Southern lands were obtained in a similar way.

Transfer to the War Department means death to the Indians. It means extermination to whole tribes, and the forfeiture of lands to satisfy the greed of hungry speculators. I do not charge that such is the intention of the War Department, or that such is the design of any considerable number of our fellow-citizens; but I do say that such would be the result of that policy. "Let us have peace." Let well enough alone. Let us not hazard another experiment.

Under the present policy missionaries have been sent among the Indians to enlighten their minds, by imbuing them with religious impressions and religious knowledge. Schools have been established by various denominations of Christians and by the aid of government for the instruction of their youths. Whole tribes have abandoned the chase—have located themselves and become herdsmen and cultivators of the soil. Some of them have already reclaimed the forest, planted their orchards, and are now eating the fruit, and erected houses, not only for their abodes; but also their court-houses and houses for religious worship.

No one can judge of these five civilized tribes, of which the Creeks form the geographical center, by simply going through the country in a palatial Pullman car; but if any one will leisurely pass among them on horseback, attend their courts and churches, and especially their homes and farms, he will conclude that the Indian problem is already solved, and that there is no need of new experiments. The enlightening and humanizing influences of the age in which we live should prompt us to allow *mercy* and not the sword to bear rule, and that we should show liberality and kindness to the unfortunate Indians. We can well afford to be liberal, and there is no need that we should be perpetually brandishing our sword in the face of a conquered and subdued people.

These five tribes are as good and as fast friends to our government as any five States north or south; and less than half the money spent in fighting Indians if spent in sending missionaries and teachers would make the wild tribes to be as truly our friends as these I have named. [The Cherokees, Creeks, Choctaws, Chickasaws, and Seminoles.]

But this question is left for discussion to those who are more competent, and I will not further tax your time than briefly to define the policy I favor. I am not wholly in accord with the present policy, though I prefer it rather than have the Indian Bureau transferred. I am for peace now and ever, but I do not think denominational boards should nominate Indian agents. As far as it goes it is a union of church and state, and as a Baptist I oppose that *toto cælo*. All that is required of an Indian agent is honesty and capability. He need not be a Baptist, Methodist, or Quaker. There are honest men out of the church, and men as capable as any Christian. The denomination to which I belong has ever been opposed to anything like a union of church and state. Let it not be asked of one who is a candidate for Indian agent, is he a Quaker? is he a Baptist? but let the questions be, is he a good and honest man? and is he capable? As long, however, as the present policy prevails, justice and equity demand that in seventy-four agencies the Baptists should have more than the one little one in Nevada.

These five tribes are suffering incalculably by the abolishment of the Union Agency. But of this I have not time to speak.

Respectfully, &c.,

H. F. BUCKNER.

Rev. S. W. MARSTON, D. D.,
Lindell Hotel, Saint Louis, Mo.

Q. Doctor, at whose instance were you nominated and sent out there as agent?—A. The Baptists.

FELIX R. BRUNOT sworn and examined.

The CHAIRMAN. The committee feel themselves instructed by Congress to confine their investigations to subjects tending to throw some light upon the question of the transfer of the Indian Bureau from the Interior to the War Department. Any statements which you can make bearing on that question will be acceptable. We would be pleased to have you give your own opinion upon the subject of the advantages or disadvantages that might result to the government or the Indians by such transfer, and state also whatever knowledge you may have in relation to the same. You may make a general statement if you desire.

The WITNESS. I do not wish to be placed in the position of having come before the committee voluntarily for the purpose of making any statement.

Question. The committee will be glad to get any information that you are capable of imparting to us, and do not consider it, sir, as any intrusion on your part.—Answer. I shall be very glad to answer, so far as I may, any questions the committee may see fit to put to me.

OBJECTIONS TO THE TRANSFER.

Q. We would like to know, from the experience you have had, whether you think it would, or would not, inure to the benefit of the Indians and of the government, or either (we must take both into consideration), to make the change. The proposition is to turn the management of the Indian Bureau over to the War Department. We desire to ascertain, if possible, whether or not it would be better for the Indians and cheaper for the government.—A. I think the transfer would be injurious to the interests of the Indians—to their welfare and progress in civilization, and it would not be economical to the government, and would not accord with the fundamental principles of our government. That branch of the government I suppose you are better posted in than I am.

Q. Do you take that view from a financial or a moral standpoint, or from both?—A. I take it from both.

Q. You think it would not be more economical to the government or more elevating to the moral character of the Indians?—A. I do not, sir.

Q. How long were you connected with the Indian commission?—A. I was chairman of the Indian commission about four years—of the board originally appointed.

Q. Your duties ceased when?—A. In the spring of 1874.

Q. During that time were you simply at home, or did you travel and visit any of the Indians personally?—A. I went, under the instructions of the board, and from time to time, at the request of the Department, visited various Indian agencies and other places in the Indian country with reference to examining into their condition, and examining the conduct of the agents, and on some occasions to make certain negotiations with the Indians that we desired. I spent the major part of four summers in that occupation. During the winter I spent very much of the time in advising with those who had control of the Indian Department, and investigating matters connected with it, with a view to correcting some of the abuses of the department—the then abuses.

DEMORALIZING EFFECT OF CONTACT WITH THE SOLDIERS.

By Mr. BOONE:

Q. I would like to ask why you think it would be detrimental to the Indians to make the transfer—upon what facts, or upon what theory, do you base your opinion?—A. My experience has shown me that the Indians in the neighborhood of military posts are always in a greater state of demoralization than elsewhere; that in some cases the degradation on both sides is beyond the possibility, almost, of description; that in cases where the military officer in command is a good man, a right-minded gentleman, and makes every endeavor to prevent these processes of demoralization, he is only comparatively efficient; that his efforts are only comparatively so. Wherever I have had conversations with the Indians on the subject and with the chiefs of the tribes, in their councils, I found that they objected seriously to having the military about them, and the reason invariably given is, that they always make trouble with their women—always interfere with them.

Q. Do you go upon the hypothesis that if this transfer is made the management of the Indians goes to the Army, and that necessarily soldiers will be stationed wherever there is an agency?—A. Partially so, sir.

Q. You think that soldiers would have to be available in case of the transfer?—A. It would be necessary that soldiers should be in the vicinity of the Indians.

Q. Suppose simply an Army officer should be detailed to attend to the affairs at the agency instead of a civilian, with no more necessity for troops than exists at present, would the difficulty of which you speak exist?—A. Of course an Army officer fitted for the duties of an Indian agent, and with the capacity necessary to perform the duties properly, would do as well as a man in any other profession; no doubt about that. Many of them are specially fitted for such duties; but, as a whole, there is nothing in the training or characteristics of the Army that specially fits them for that duty. The education in so many instances giving an arbitrary and overbearing character to the younger officers of the Army, would unfit them for their daily intercourse.

Q. Speaking particularly of the moral influence, you suggested awhile ago that this contact with the Army was demoralizing to the Indian women. Now, if the Army itself is not present, and no soldiers are present, that argument cannot be advanced, can it?—A. Of course not.

Q. There is nothing, is there, in the education of an Army officer that makes him more lustful than any one else?—A. No, sir; I had no reference to the Army officers.

Q. Perhaps your evidence would leave that impression?—A. I should be sorry, indeed, if it left any such impression.

Q. You simply meant to state that where the Army has been brought in contact with the Indians, the influence of the Army has been bad upon the Indians?—A. Yes, sir.

Q. And that is the theory upon which you base your judgment that the transfer from the Interior to the War Department would not be beneficial to the Indians?—A. Partially; that is one of the points. There is another point suggested in that connection, the example of the Army officers is detrimental to the Indians.

BAD EXAMPLE OF THE OFFICERS OF THE ARMY.

Q. In what respect?—A. The Indian chiefs are averse to labor; they have to be taught and trained to it, and they are better influenced by example than in any other way. They look upon the Army officers as the chiefs of the white people, and they, being chiefs of the Indians, wish to live and do like the white chiefs. They look upon labor as degrading, and they get an example, of course, from the Army officers. I think that influence has kept them back in many places.

Q. What has been your observation in reference to the agents that have been appointed; have they set a good example as to industry, &c.?—A. During the period of the administration of Indian affairs with which I was personally acquainted there were a great many of them that did. I presume it is so now, though I cannot say. In some cases they induced the Indians to begin building houses, and so on, by helping them themselves and by employing such persons about them as were willing to do that duty.

Q. You think that the training of an Army officer would not fit him for that?—A. I do not say it as any criticism upon the officers.

Q. You think the advantage would be in favor of a civilian over an Army officer in the way of example?—A. I think so decidedly. There are other points connected with the duties of these Indian agents—the Indians relying upon them very much in their details—that an Army officer would not be bothered about.

ECONOMY OF THE TRANSFER.

Q. Have you anything further that you wish to state?—A. The impression seems to exist that the Army could be economically used for this purpose.

Q. How is that?—A. That the Army could be used in the management of the Indians with greater economy than it is at present managed under the civil system. I do not see how that argument, even if it were correct, could be one of any great force in reference to the Indian business any more than to any other department of the government. If it comes simply to a question of direct economy, as to whether we can manage our government, or any portion of it, by means of an army, I do not think it would take very long to make the choice. There are, according to my recollection, about 77 or 78 Indian agencies, scattered of course widely. There are about 50 of these agencies located not less than 20 and from that up to 200 miles away from where the soldiers are. The Indians, where they are allowed any discretion in the matter, keep as far as possible from the military for the reasons I before mentioned. That is the actual situation; they are from 20 to 200 miles away from the military posts. I think 20 of them between 100 and 200 miles distance.

DISTANCE OF INDIANS FROM TROOPS.

Q. Do you recollect of any tribe that is that far off?—A. I think there are at least 8 agencies and not more than one or two military posts in Oregon; consequently many of them are a long way off. I do not think there is one nearer. I do not know of any Indian agency or tribe near a military post in Washington Territory, with the exception of the Nez Percés. Speaking of the Nez Percés, perhaps it would be taking too wide a range to say that the location of that post is rather odd. But to pursue the thought I was endeavoring to express, the distances between the places actually occupied by the military and the reservation and agencies of the Indians in so many cases being very considerable, I infer that there would be no very great economy in undertaking to remove the Indians to the neighborhood of the posts or the posts to the Indians. In 1869, on my visit to Fort Sill, as the result of an investigation there, I recommended that certain of the duties connected with the Indian Department could as well be put under the direction of the Army at certain posts, because the quartermaster's department was supplied by transportation, and I thought at that time that they could transport Indian goods also; and I accordingly recommended that it should be done by the Army.

By the CHAIRMAN:

Q. Did you make any such suggestions to the government as an improvement upon the present plan of managing the Indians?—A. Yes, sir; I made suggestions from time to time. Not very many of them were adopted, however, while some improvements were carried out by the direct action and agency of our Board of Indian Commissioners. There is another point in reference to the question of economy. Your committee are, perhaps, aware of the fact that there is a very considerable force of civilians employed by the Army; that certain kinds of labor at many of the military posts, such as transportation, certain clerical duties, and, in fact, the duties of the very nature of those that must be performed by an Indian agent, are really not performed by the officers of the Army. Their labor is supervisory, and they employ a civilian force to perform a great many of those duties even at the military posts. The persons who are under the direction and in the employ of the agents at many of

the agencies where treaties exist are teachers and mechanics of various kinds. I do not know that the Army officers generally have any special fitness for these kind of duties or the management of them.

Q. Your idea, then, is that the same amount of money that they pay out to the civilians would go fully as far if paid through the Indian Department?—A. No, sir; the idea I meant to express was that, if the suggestion were adopted of placing the Indians under the Army or War Department, the same expense would be incurred in the matter of procuring the labor about the agencies and doing the duties which are done by the agents, and those employés would still be necessary, as it would not be done by the officers. There would be no economy, therefore, in that matter, nor could it be done by the soldiers.

INTRODUCTION OF WHISKY AMONG THE INDIANS.

If you will allow me to give one other reason and go back a little in so doing: One of the great difficulties in the advancement of the Indians is this matter of the introduction of whisky into their country. The exception in reference to the introduction of ardent spirits into the Indian country is made in favor of the Army. Any liquors may be introduced by direction of an Army officer or at his suggestion or wish. At all the posts there are suttlers, and they have whisky, and whenever the Indians come to the posts it is found, as I learned from very prominent officers when I visited the posts, to be impossible to absolutely prevent the Indians from getting whisky through the soldiers and suttlers.

Q. Was this subject discussed at all during your administration of affairs as president of the board?—A. Yes, sir.

Q. And while you were visiting the Indians?—A. Yes, sir; it was proposed to Congress several times, I think, during that time. At that period a great deal of interest was felt on the general Indian subject. A report was made by a committee of which Senator Doolittle was chairman, which committee made a very thorough investigation on the same points on which your committee is acting among others. The report contains a great deal of testimony on this subject.

INDIANS AVOID CONTACT WITH THE ARMY.

By Mr. McCREERY:

Q. Did I understand you to say that the Indians were inclined to avoid a contact with the military in order that they might preserve the chastity of their families?—A. Well, that is one of their greatest reasons for objecting.

Q. They have no apprehensions on that score from the neighborhood of the agencies, or are they free from apprehensions?—A. There is a great deal of difference between an agent and a military company.

Q. I speak of the surroundings of the Indian agencies?—A. Yes, sir; where there are soldiers near the Indian agencies their troubles are very great on that point; it is very corrupting both to the soldiers and the Indians. An examination of the records of the War Department will convince you of that—reports of the medical officers of the War Department. Such was the case when I was in California. I did not visit the post myself, but one of my clerks did; he went there and made a report. There is an Indian agency at Hoopa Valley. The Indians surrounded the post, and the most terrific diseases prevailed among the troops and Indians. A medical officer spoke of it in the most positive terms as demoralizing both to the soldiers and the Indians in that vicinity. In another case I was at a military post where I found very bad feel-

ing on the part of the officers of the post against the commanding officer. I might touch on tender ground, and I think I will stop.

Q. I wanted simply to ask you the question whether there was any apprehension with respect to the virtue of their women in coming in contact with the agencies?—A. I have never had any opportunity of observing.

Q. You seem to have observed the other?—A. I could not help it.

Q. And this you did not observe?—A. No, sir.

Q. You could help observing this?—A. Yes, sir; the Indians nor the Indian agent told me nothing about it.

NECESSITY OF TROOPS AMONG THE INDIANS.

By Mr. BOONE:

Q. Why would it be necessary to have any more soldiers stationed among the Indians than there are at present if the management of the bureau were transferred to the War Department?—A. I do not think it would be necessary.

Q. If there was no necessity for more soldiers among them, then the difficulty of which you speak would not exist, would it? It would not be increased? The difficulty exists now, and even under the present management I understand the soldiers are at or near the agencies?—A. Yes, sir.

Q. The number of soldiers required would not be increased, would it, by transferring the management of the Indians to the War Department?—A. I think it would certainly do it.

Q. Why?—A. Simply because it is necessary for the officers in the discharge of their duties to have soldiers about them.

Q. I do not understand why it would be more necessary to have troops around if the agent were a military officer than if he was a civilian. I would like to have you explain that. I confess I am not posted on that subject.—A. If there is the advantage claimed in having the control of the Indians under the Army—if the advantage that is claimed by the military gentlemen who urge it has anything in it, it is that they may control the Indians by means of their military power and force, and of course they cannot do so unless they have the soldiers. That is my inference about it.

Q. That is exactly where I think there is a mistake. In other words, you understand—at least the drift of your remarks seems so to indicate—that to transfer the management of Indian affairs to the War Departments necessarily puts the Indians under the control of the Army?—A. Yes, sir.

RESULT OF THE MANAGEMENT BY THE WAR DEPARTMENT.

Q. And they are to be governed by the Army?—A. Yes, sir.

Q. And it is from that standpoint that you view this question?—A. Yes, sir. I take it for granted that that is the idea and intention of transferring to the War Department. The control of this business was in the War Department, of course you know, in the past, at the beginning of President Grant's administration. President Grant had had certain experiences among the Indians of the West, and he knew of the corruption which had crept into the administration of Indian affairs and he was anxious to reform it. He adopted as a preliminary measure the dismissal of all the then Indian agents and the substitution of military officers in their places. I think nearly all the agents were officers of the Army within something less than a year after the commencement of President Grant's administration. They continued about a year. When

Congress appointed a board of Indian commissioners of course it was very natural that our investigation should bring much of the conduct and management of the agencies during this interval under our notice. I found that while that were some exceptions, in other cases the management was worse than it had been before, and it was shown to be so by the conduct and actual condition of the Indians when I came to visit them. Of course this would not have been the case had there been a careful selection from the officers of the Army of those who were intrusted with this duty. In one case an officer was sent and kept out there where he could not get any whisky. That was his qualification. In another case two officers had successively been appointed, and in one of these cases it was admitted—at least I so learned from other officers—that that was the idea connected with the appointment, and they did not succeed in reaching the reservation during a period of nearly a year. The Indians at that particular agency were without an agent upon the failure of those two gentlemen to reach the place. In another case an officer succeeded an agent who had been one of the most successful agents, and I believe now can show the most remarkable success in the right management of the Indians. The officer lost a large herd of cattle by mismanagement, leaving but few where there had been a great many, the result of a year's care and accumulation. In another case an Indian came to me to complain and brought me a letter of evidence of the conduct of an agent [who had been put back in his former position] because he opposed polygamy. The letter stated that they had a right to have as many wives as they wanted. Well, perhaps they have; still that is not the way to civilize or advance them. Now I state these things, simply giving an idea which I have myself, that you are just as likely to get inefficient and bad agents in going to the Army for their selection as you are in selecting them from civil life.

Rev. JAMES H. WILBUR sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. I reside in Washington Territory, upon the Yakima Indian Reservation.

Q. I believe you have had long experience among the Indians, probably as long as any other agent that is now in the service; we are trying to gather such facts as we can touching the subject of the transfer of the Indians from the civil to the military or War Department. We wish to gather such facts as will throw some light upon the feasibility of the step as to whether it will be to the advantage of the government, and to the advantage of the Indians, or either, to transfer them to the War Department, or whether it would be better to leave them as they are. This is the subject of this investigation. We want to get from you as many facts as you can give us touching that question. I believe you have had the management of a number of Indian tribes, have you not?—A. Well, ours is made up of different tribes, and is called the Yakima Nation. There are some ten different tribes or bands connected.

OBJECTIONS TO THE TRANSFER.

Q. From your experience, then, do you think that it would be to the advantage of the government or to the advantage of the Indians to make the transfer of the Indian Bureau to the War Department?—A. I think it would not, sir.

Q. In either case?—A. I think not, sir.

ADVANCEMENT OF THE INDIANS IN CIVILIZATION.

Q. State whether or not the Indians which you have the management of are making any progress towards civilization or christianization. Are their morals being improved from time to time, as you understand it?—A. Yes, sir. I was solicited to go among the Indians in 1866 as superintendent of instruction. I remained there as superintendent of instruction for four years, with the exception of about six months that I was absent. During that time I made every possible effort that I could to induce the Indians to work. I found that they were not disposed to work; that they were fed by the agent, that rations were issued to them every week, and there was no working among them. They had never plowed at all, nor sowed, never raised anything; and in order to get them to work I found it was necessary for me to set them the example, and I went right into the work myself, holding the plow, breaking in the cattle, making fences, sowing seed, &c. The first year after I was there, as superintendent of instruction, I gathered some twenty-five children, boys and girls, from the camp to a boarding-school, and with these boys, the larger boys that were in the school, we plowed some twenty-five acres of land, and fenced about eighty acres and raised some three hundred bushels of wheat, and about five hundred bushels of potatoes, and fifty bushels of corn, and garden vegetables enough to support the school and have some seed for the parents of the children.

AGRICULTURE AMONG THE INDIANS.

From that little beginning the Indians were encouraged to work, and the cultivation of the soil has gone on with our Indians until now we have some 16,000 acres under fence. We have 6,000 acres in cultivation. We have raised for the past three or four years—four I think, three certainly—all that the Indians need to subsist upon. We have not bought a pound of flour, nor a pound of beef, nor anything except it be that we bought some sugar and some sirup for the school—something of that sort; and we have not bought or issued any rations to the Indians of that nation, with the exception of some for the sick and the needy. My practice has been to have the Indians work if they wanted food, and if they were unwilling to work to let them go hungry. When they would work, however, they would commence very awkwardly, and make a man's bones ache to see them shovel or hoe, or hold the plow; yet they would go to work and do what they could to get into the habit of work and to become more experienced, and they got paid for it. We have been in the habit for years of making them work for everything they got; food and clothing, and so on. We issue nothing, unless it be to the sick and needy of the agency. We have kept a boarding-school. I said I was appointed agent in June, 1864.

MANAGEMENT OF THE INDIANS BY THE WAR DEPARTMENT.

At the time it was turned over to the military in 1869 or 1870, as your honors are aware, there was a man by the name of Lieutenant Smith who took my place. I was relieved for about eighteen months, and then went back in charge of the agency. During that time our agency ran down very much. Lieutenant Smith was a man that had no experience whatever in the management of business affairs. He said to me when he took possession, that he knew nothing of the management of business, he had not been educated to it, and he was a little reckless. He said to me once and again that he did not care, with an oath, anything about what the Indians did. He calculated to draw his pay, and that was all he cared about the agency. During his continuance there, for the

eighteen months, I did show to the department that the agency had lost at least $40,000. The Indians now have churches and farms and houses and horses and cattle and wagons and plows and harness, and are really self-supporting. They could, without a dollar's expense, take care of themselves now. We have about 3,700 Indians. We have never had any soldiers at the agency at all during my administration there.

NO NEED OF SOLDIERS NEAR THE AGENCY.

Q. You say you never had any soldiers at your agency?—A. Never had a soldier there, never had occasion for any. The Indians have been loyal, and now are very faithful in work. We have built, during the lastfour years since I have been with them, a steam saw-mill—put in a planing-machine, a shingle-machine, and some other machinery, that is worth $15,000; yet the government has never contributed a dollar to help us. The Indians cut the logs and hauled them to the mill, attended the screws, took off all the lumber, and had full charge of the machinery, with the exception that two young men were there, one stationed at the lever to give directions how the lumber should be sawed, and another that took the general oversight of the machinery. They have about 3,500 head of cattle, about 17,000 head of horses, and sheep, and swine; and, as I said, have very comfortable houses. They have houses that are worth from $100 to $500, quite a number of them painted outside and in, with tables, clocks, and furniture; so that they are living like white people. I would be glad to have the commission ask me any question that they may desire.

Q. How many Indians have you under your charge?—A. There are 3,700, or about that number.

Q. What proportion of them are what we call "warriors"—men, perhaps, it would be as well to call them?—A. I suppose you mean those that are adults?

Q. Yes, grown men.—A. In the neighborhood of a thousand.

INDIANS AT THE YAKIMA AGENCY PEACEABLE.

Q. And you have had no difficulties or troubles with the neighbors or other people around you?—A. None at all, sir; I have had more difficulty with the whites around there than I have had in governing and dealing with the Indians.

Q. You are pretty well acquainted, I take it, with the Umatillas?—A. Somewhat. I have tried to enrich our Indians by minding my own business.

Q. I have been told that they are very successful in raising stock.—A. They have considerable stock, but do not cultivate the soil much. I suppose our Indians, so far as I know, are in advance of any Indians there in the cultivation of the soil.

Q. I think that has been what I have heard myself from evidence that has come before our committee on other occasions.—A. During the war with Joseph and his Nez Percé Indians, ours were perfectly loyal this season, although the war was just across the Columbia River, along the base of the Blue Mountains; we had no soldiers, and no occasion to keep a police force to guard the agency.

NO NEED OF THE ARMY AMONG THE INDIANS.

Q. Is it your opinion from your experience, which has been a long one, that we could soon get along without the Army if the Indians were properly managed—that is, after these wild Indians have been broken in, could we then lessen the Army?—A. It seems to me so, sir. I have been

on the coast since June, 1847. I left New York in November, 1846. The Indians were very numerous then in Oregon, and Oregon at that time embraced what is now included in Washington Territory and Idaho, and extended to the Rocky Mountains. The Indians were very numerous the year I went there. They died by hundreds, and I may say by thousands, in the fall of 1847. The immigration that came in in 1847 brought with it the whooping cough and measles, and the Indians on the coast had never before that time had either the whooping cough or the measles, so that it spread among the old and the young; and their habits were such that they would go into a sweat-house and get into a great perspiration, and then pitch off into a cold stream; and it was almost universal death to them. They died by hundreds there in the winter of 1847–'48.

Q. Are they holding their own now as to numbers?—A. Ours are increasing. For a few years after I went among them, they diminished a little, but as soon as they adopted the habits of civilization they increased in numbers, and they have been increasing. As to their progress, they have constructed two good church edifices, and they have built mills entirely without expense to the government. They have a church membership of over five hundred, and they are as orderly as any Christian people that I have ever been associated with. We have less stealing and fewer difficulties among our Indians than among the same number of whites, it seems to me, anywhere in our country.

INDIANS DESIRE THE EXTENSION OF THE LAWS OVER THEM.

Q. Would you prefer, from your knowledge of the character of the Indians, to extend the laws of the government over them, the same as we do over the whites, punishing them for the same offenses and in the same manner?—A. Yes, sir; our Indians would be glad to have it.

Q. You think they would be glad to have it?—A. Yes, sir. We have got some wild ones that like to have their blanket and would like to wander; but the Indians, as a whole, would rejoice to have the laws applied equally to them.

Q. Have your Indians adopted our custom of dress?—A. Yes, sir; to a great extent. Some of them think they are "big Indians," and prefer to retain their own dress, but the number is constantly lessening. Their farming gives additional influence to those that are willing to go in and cultivate the soil; and it seems to me that the great need is to teach them to work, and set them at it. I think I am not mistaken in this. I have been studying the Indian for eighteen years as thoroughly and earnestly as I ever studied mathematics or anything in the world, when at school, and it seems to me that the great need is education and work. Their fathers have not instructed them; they know nothing about farming; they need to be taught; to have an example given them, and that example, it seems to me, must come from the agent. He cannot do it by proxy; he cannot point his finger here or there and tell John or Joseph, or some one else, to go and construct something; he has got to go himself. That has been my experience. I have been in the woods with them, stripped down to shirt and pants, for six weeks, helping them to build a mill. Then, I have held the plow, and plowed more than two hundred acres of ground. When they first started in to receive instruction how to do it, it took a good while. The wild Indians would make crooked fences at first, but they went on with it, and now they can make as straight a fence as anybody, and can plow as much land and sow seed as well as any one. They have a great many of the improved machines that are used by the farmers.

DESIRE TO HOLD PROPERTY IN SEVERALTY.

Q. When do you think the time would come—or would it come at all—when your Indians would be willing to hold their property in severalty, as we do?—A. They are ready to do it now. I staked off the land when they first began to work, so that every man should eat of the fruit of his own labor. They have got their farms separated; their farms, houses, cattle, wagons, sheep, and a number of these things are now held in severalty. If I may be permitted to go further, I would say that with three things the Indians of the nation—I do not mean simply the Yakima Nation, I mean the 270,000 Indians—may be made self-supporting. I know no reason why, with the muscle they have, they should not be educated to work so as to support themselves, and relieve the government of the expense. I know no reason why they should not do this.

First. They want good land, that if properly cultivated will be remunerative.

Second. They want an agent that is capable of managing his own business, to make them thrifty, and one that has sympathy for the Indians, and who will try to reach down and help them up. And I should say, also, a Christian man—a man who has faith in God; one that has some regard to the value of humanity—sunken though it may be, very low.

Third. And in the third place, let the government appropriate means to get seed, and at least the teams to help them until they can be educated so as to take care of themselves.

I think I speak understandingly, sir, from the fact that I believe that our Indians were as low as they well could be; and I have the authority of General Alvord, who was acquainted with our Indians, and who attended a meeting at Washington where I made a little address, and said that he knew that when the Indians were taken from the war-path, they were as unlikely to be educated and made self-supporting as any Indians in the nation.

I would be glad to answer any other question that may be put to me.

THE INDIANS MUST BE MADE SELF-SUPPORTING.

Q. You may go on and make any general statement that you wish.—A. I will say in addition to what I have said that we have never had occasion to ask for more money for our agency. We have always had money enough; and from year to year I have turned back money that has been appropriated for the use of our agency, to the department—not every year, but from time to time I have turned back money that has been thus appropriated. There is money enough, if muscle can be brought to the plows and to the cultivation of the soil by the Indians, and that is my purpose. I have no desire in the world to feed the Indians wrapped up in a blanket—buying beef and buying flour, and buying sugar and coffee, and dealing it out to them, and letting them remain idle. Put them to work—and they can be put to work if the agent himself has the work in him, and will set them the example, and put them to it.

By Mr. BOONE:

Q. What is your experience among the agents generally; have they a disposition to set the example in that respect?—A. As I have said, I have never visited an agency since I have been appointed. I have tried to make our Indians rich by minding my own business. So far as I know, there is some effort made to instruct them in cultivating the soil and making fences, and in building houses. On going among them I was solicited first to take the place as superintendent of instruction; and then, during the war, and at the time of the battle of the Wilderness, it

was feared that the Indians might be drawn off into hostility, and I was solicited to take charge of the agency. And I can say, without any fear of successful contradiction, that, having exercised no influence directly or indirectly to be continued at the agency, I have been appointed since from time to time.

By Mr. McCREERY:

Q. How many wild Indians are there around you?—A. Do you mean upon the Agency?

CONDITION OF THE INDIANS AT YAKIMA AGENCY.

Q. Yes, sir.—A. I should suppose that two-thirds of our Indians were what you might call, to quite an extent, civilized—partly civilized. Some of them read and write and cipher. I believe we have three hundred that read and write and cipher. Then I ought to say further that it has been my plan, as soon as we have had children in the schools educated to read and write, to put them into the shops to learn trades; so that we have blacksmiths and gunsmiths, and carpenters, and plow and wagon makers, and shoemakers among the Indians; and it has been my plan as fast as I could get an Indian to do the work to drop the white man out, giving the Indian the preference. We have got reduced down until we have not half the whites that we used to have in the shops, and we are doing ten times as much work—principally by reason of the machinery.

Q. You have got them beyond that point where they consider it degrading to work?—A. They have got to learn that work is honorable; and I do not allow them to go about the place loafing, nor allow them to idle about the station at all. They go like other men to the shops for business, and when they get through with their business they go home; but nobody (and I say it frankly) can put their feet on top of the table and sit down in an office and smoke and say to the Indians, "You go and get that and bring it to me." It is sweat and labor, and constant labor, to get them started. To get the children from the camps to the schools is very difficult. When they first came, they didn't look as if they were worth more than a rabbit; I could hold all the clothes they had in my two hands—nothing but a shirt and a little sort of pantalette; now they are respectable men and women. They are in the school, and are living in comfortable houses, and, as I said, have got wagons and horses, and some of them ride in carriages that have cost two and three hundred dollars. Many of them were not worth a cent when they came, and are now worth their two and three and four and five thousand dollars.

INTERMARRYING BETWEEN WHITES AND INDIANS.

By Mr. BOONE:

Q. Is there any intermarrying between the white people and the Indians?—A. No, sir.

Q. None at all?—A. Occasionally there was, before I went there. I have put a heavy hand on that. I do not want our Indians to degrade themselves.

Q. You think, then, that the Indians are better than the white people?—A. Yes, sir; in that respect, I think a white man who comes down to an Indian woman is a little below the Indian woman.

Q. If they have advanced as rapidly as you state they have, it would not be much of a degradation for a white man to marry one of them, it seems to me.—A. There is very little difficulty in governing the Indians, it seems to me. They are grown-up children. A steady hand, and

meeting your engagements with them, is what is needed. I have had no trouble. I say no trouble—occasionally I have had to take an Indian by his long hair, and put him into the jail; but those instances have not been as frequent as where—I was going to say—I had to do with white men. I have had as many as five or six white men in jail at the same time.

AUTHORITY OF INDIAN AGENTS.

Q. Has an Indian agent all that authority, to put people in jail, &c.?—A. Well, I assumed that authority. Perhaps I should learn if I were in this city that I had not that authority, and I may go back with more wisdom in that regard than I came with.

Q. No doubt your government has been very salutary on that point.—A. When white men have come on the reservation with whisky, and been depredating on Indian women, I have laid hold of them and put jewelry on their ankles and put them in jail, and they have marched out to grub out oak grubs, and we have made a garden spot of thirty acres, mostly with prisoners, and a good deal of it with white labor. Occasionally I have had a white man in the jail that would say he would not work, that "Wilbur had no right to make him work," and my men would say to me that such and such a man would not work. I would tell my man to say to him that he need not work, but lock him up in a room by himself and give him nothing to eat or drink until I told them to, and I impressed very clearly upon them the principle I had laid down that "he that does not work shall not eat," and I have never had any of them starved to death on my hands. I kept one for thirty-six hours, and I would have kept him many hours more if he had not worked.

Q. You are the agent at present, I believe?—A. Yes, sir.

Q. Is the reservation where you are agent under the same rules that govern the balance—that is, were you nominated and sent out by any particular religious denomination?—A. I was appointed before that rule went into effect; and I have been kept right along since that time, with the exception that I gave place to Lieutenant Smith that I spoke of.

RELIGIOUS INSTRUCTION OF THE INDIANS.

Q. Without going into an investigation at present, I would like to have your opinion as to what you think of that policy of farming out these Indian reservations to different religious denominations, and prohibiting others from sending their missionaries and teachers among them?—A. My experience would prompt me to favor the arrangement. I think that where the law allows the Indians to decide who should be on the reservation and refers the matter to the Indians, and to the agent and the superintendent, that no other body of Christians should come upon the reservation until the proper steps are taken, and until the Indians are consulted.

Q. I understand that the present policy allows, for instance, Methodists or Baptists or Episcopalians or Catholics or Friends to nominate an agent?—A. Yes, sir.

Q. On account of his religious proclivities and connections he is appointed to a certain agency, and that under the present arrangement they have the exclusive right to propagate their religious opinions among that nation?—A. No, sir; I have not so understood it.

Q. That is my understanding of it; I may be misinformed.—A. The law of our agency is that no white person shall be permitted to settle upon the agency (that is, unless he be an employé) without first gaining the consent of the Indians.

Q. I understand that to be so, and it applies to anybody and everybody,

but in the discretion of the agent. If a particular church designates an agent, he is appointed to take charge of that agency as its agent. Has anybody else the right to come there and establish schools and churches and missions and anything of that kind?—A. I suppose they would have such a right—that is, unless the law prohibits it, I suppose they would have that right; but if I should express my own judgment, it would be this: that with the Indians it would not be good policy to have two heads; I think it would work badly; I think it would work a division with the Indians, so that they would be following this man and another man, it and would tend to divide them. I think it would be better to have them, so far as may be, separate. That would be my judgment.

Rev. JOHN C. LOWRIE sworn and examined.

By the CHAIRMAN:

Question. The object of this commission is to gather such information as may be obtained in reference to the management of the Indians and as to the feasibility of transferring the Indian Bureau from the Interior to the War Department. If you are in possession of any information pertinent to such inquiries, the commission would be glad to receive it.—A. If you will allow me to go right into the middle of the subject without introduction, I will state that the matter of nominations (and there are several nominations of these missionary boards at certain agencies), so far as our missionary board is concerned has been under my charge (I mean the correspondence in reference to them), under the direction of the board itself. For the last eight or ten years I have had charge of the correspondence with the Indian Bureau on the subject. Our board resolved at the outset in the first place to make no nominations until requested to do so by the department. In the second place, not to indorse nominations—that is, not to indorse recommendations—of persons desiring to be appointed so that they could go down to Washington and push their own way. We resolved on that in deference to our people, the Presbyterians, who have a great aversion to anything like a close connection between church and state, and we were not willing to appear to be anxious; but we consented to make these nominations chiefly for the reason that we wished to aid the department—it was their request and not our seeking—in obtaining upright men; and during these years I think 22 or 23 agents have been nominated by our board to agencies in New Mexico, Utah, Idaho, and the Nez Percés Agencies. Nine of those agencies were tendered to our board at the outset. Some of the agencies have been discontinued and some consolidated, and I think we have but four at present. We made no objection to any change.

Q. Do I understand you to say that you have had as high as 20?—A. In succession we have 22 or 23. I was going to state that. We were very careful with each and every case, and I have communicated with the officers of the bureau, and so far as I know there has been no instance in which the government has lost one dollar through want of integrity. I believe that to be a correct statement.

OBJECTS TO THE TRANSFER.

In the second place, in regard to the question of the transfer. I am one of those who are proud of our little Army and its officers, especially of its officers. I have had sufficient intercourse with them to appreciate them. We have men among them perfectly competent for that

particular work; but as a general rule their training has not been in the line of our labors, as you will all readily see. They are trained for a special service. Now, I say, and I say it before this commission and the country, that I think this Indian agency business is a very peculiar service; and in answer to letters of inquiry, of which I have received very many, I usually specify four qualities: First, integrity, through and through; second, business capacity and habits; third, energy; fourth, ability to govern men. With these four qualities I think any man, be he soldier or civilian, could be successful in the management of the Indians. I would couple with those qualities one other, suggested by Father Wilbur—this idea of making them work. With these qualifications, I do not see why gentlemen would not be successful as agents. My impression is that you cannot expect very many officers of the Army to improve the Indians in certain particulars, for instance, these business matters and a capacity for cultivating the soil. I look upon the work to be done by the Indian agents, as I before stated, as peculiar. I think it is largely as Father Wilbur stated to us. I think it goes further.

THE NECESSITY OF A COMMON SCHOOL SYSTEM AMONG THE INDIANS.

I think the government ought to take the ground in regard to the Indians that our States do in regard to their own citizens—it ought to support a system of common-school education for all these Indian tribes. Every Indian of suitable age ought to be in a school supported by the government and under the charge of the Indian agent. For this service you should have men specially qualified. Then there are other questions which have been referred to by gentlemen preceding me, as to the Indians being placed under the jurisdiction of our civil law, and as to the best means of developing industry and economy on their part, and all those things. It seems to me you ought to have men specially adapted to this purpose.

THE PRESENT SYSTEM MOST ECONOMICAL.

Q. Give us your opinion, then, if you have formed one, as to the propriety of this change, viewing it from an economical standpoint.—A. I think so far as the question of economy is concerned that it is in the interest of economy to continue the present system and not transfer it to the War Department, and if your time permitted I could go into the case as far as delicacy would allow. My own convictions are clear that economy will be secured by perpetuating the present method. I wish to say to the gentlemen here that this is an additional duty imposed upon me in my official capacity. I am connected with a missionary board whose object is to support and spread the gospel among the people of the world. This duty was assigned to us, and it is entirely incidental to our main work, and does not impart to us any pecuniary advantage whatever. Often the agencies tendered to our board were not in places where we have missions. We have some missions among the Indians, but not in all cases where we have agents. We have never raised the question as to whether a man was a Republican or Democrat. We do not raise the question in that regard. We look upon it as a matter of importance, though not essential, whether a man is Presbyterian or not. We have nominated gentlemen who were not Presbyterians. We look to the main idea of getting an upright man. That is our main wish and desire. I wish to say in connection with this, that I, in common with the other gentlemen who have been giving information, represent a large portion of our people in this land. I suppose it would be a very moderate estimate to state that the Presbyterians probably number 200,000

voting citizens; the Methodists and Baptists a still greater number respectively; and my judgment is that nearly all of our people are ready to stand by the existing system, thinking it better than the system proposed to be substituted for it, by transferring this work to the War Department. I think that is true; as far as I know that is the feeling of our body. I believe also that it is the feeling among other portions of the community. Not that we do not see things that ought to be redressed and removed; we see them, on the contrary, very clearly, and hope they will be corrected; but in the main, looking on the question as a broad one, I think that is the general impression of our people.

THE INDIAN BUREAU SHOULD BE A CABINET DEPARTMENT.

One other point if you will permit me. For many years it has been my judgment that a very great change ought to be made in our administration of Indian affairs. I had occasion some nine or ten years ago to write an article on the subject of Indian affairs, in which I suggested, with a good deal of hesitation, that perhaps it would be better to make a department of Indian affairs instead of a bureau of Indian affairs. It was a thought that occurred in connection with the subject I was treating of. Since then I have studied the question with a great deal of care and patience, and my judgment is clear that it would be wise for our government to create a department of Indian affairs; to bring this bureau up into a Cabinet, position, and let it be under the eye of the Cabinet and the President, and under the eye of the nation. Now it is a bureau—one of six or eight—under a Cabinet officer. The Secretary does not live who can do full justice to all these bureaus. That is my judgment after studying this matter for some time. I have met very competent and upright men connected with the administration of Indian affairs. I go to Washington on this business now and then. I have met a number of gentlemen there connected with the department and bureau, and have been greatly pleased with what I saw of them. I have been surprised that men would undertake to administer such extensive matters as are now devolved upon them. It seems to me that it would be far wiser for 15 or 20 years to make a department instead of a bureau of Indian affairs. It would involve scarcely any additional expense. The present staff of clerks, &c., would remain. The Commissioner would become a Secretary, and the matter would go into the Cabinet and be a subject of Cabinet consideration, and be under the general eye of the nation. Such a course would create a healthy degree of public sentiment and feeling that would be invaluable. I would be pleased to respond to any questions the commission may wish to propound. I appreciate the lateness of the hour and your fatigue.

I would like to have it understood by this commission that we are here perhaps under some misapprehension. We were requested to attend this meeting by the Commissioner of Indian Affairs. It was a very great personal inconvenience; but under the impression that it would be in the interest of the cause that convened your commission, we consented to come. My engagements are such that I am compelled to return to New York to-morrow, where I live.

WHERE AGENTS ARE APPOINTED FROM.

In reference to the portion of the country where those agents came from, I went over this list of upwards of 20 men, and found that a considerable majority of them lived west of a line drawn through the State of Ohio. I believe that is true in regard to our men. I spoke of their integrity. Two or three of them were incompetent, which was proved to

be true, and were removed or resigned. We all regarded these agents as officers of the government and not of our board after we nominated them.

Rev. M. E. STRIEBY sworn and examined.

By the CHAIRMAN:

Question. You have heard a statement of the object the commission has in view; we would be glad to hear from you in reference to the advantages or disadvantages that may arise from the transfer of the Indian Bureau from the Interior to the War Department.—Answer. I would be glad to correct one or two misapprehensions which I think prevail on the part of some; one, at least, that if our body, for instance, the Congregationalists, should appoint an agent in a given territory, that all other religious denominations are thereby excluded from that field. So far from that being so, the agent has no control whatever over the religious instruction of that particular district. For instance, we are intrusted, as representatives of the Congregationalists, with the appointment of six agents. In but one of those do we have a Congregationalist missionary. The missionaries in every other case are of other bodies. Of the missions in our agencies, several are of the Presbyterian board, in some instances Catholics, and in other instances Baptists. The agents being occasionally nominated by us, have no control whatever over the religious instruction of the Indians except to give support and help to the minister in that district, whoever he may be. I would say, further, that the benevolent or religious societies who have those appointments receive no pecuniary advantages whatever from the transaction. It is an addition to our burdens that is very onerous. I have no more perplexing part in my duties to perform than seeking to procure suitable persons for these positions. It gives endless perplexities, with no compensation in any shape or form except in that we think we are doing good to the Indians, and, through the Indians, to the government.

OBJECTS TO THE TRANSFER.

Now, Mr. Chairman, I believe that the transfer of the Indian Bureau to the War Department would not be advantageous either to the Indians or the government, and I have several reasons for so believing. Let me say this: If the question is simply between appointing an Army officer and a civilian to a certain agency, it is then a question, it seems to me, hardly worth a great deal of consideration. I accede entirely with the statement that military men are not trained for this kind of work. But then the military man may be as good as the civilian, and if the question is narrowed down to that, whether the agent shall be a civilian or a military man, it seems to me not a very great question. I look upon it in a far different light. I regard the question as to what shall be done with the Indians as the real one. They are here to stay, and we have found it hard to exterminate them, and, perhaps, cannot do it. Shall we then do something or other with them? Here comes the proper inquiry of this commission. Shall it be the policy of appointing civilians selected with reference to their competency for the place, to do what Father Wilbur has done, and to do what he has not made so prominent in his statement, as I am sure he has in his heart—to elevate and build up and christianize them by example and by teaching? With this question it seems to me there cannot be much doubt—at least not in my mind—that it would not be wise to make this transfer, because if the transfer is made to the Army, unless there be entirely a distinct custom

inaugurated, it is to go on detailing Army officers to attend to the management of these Indians with no system adapted to their improvement. If a system is to be adopted for their improvement that shall contemplate taking the ax and hoe and plow, and going on up to the school-house and church, then it seems to me the government must adopt a policy tending in that direction. If the policy is to try to elevate these Indians, and it is something else than exterminating them, then select civilians with that in view, and adopt all these measures to that end as the true policy. The great difficulty is to secure proper persons.

QUALIFICATIONS OF INDIAN AGENTS.

Recently I put into one of our monthly magazines a statement to the effect that they were not sinecure positions for any man, layman or minister; but they call for men who know about farming, agricultural and mechanical work; and he must be a man of integrity, a man of business experience, and, added to this, he must be a man competent to manage men. He must be a man of piety. Now, if there be an effort made to secure such men, as I think we do make, we are in the right line.

I will give you an illustration or two. The cheapest thing in the world is a letter of commendation. I find a letter recommending Mr. A. B. in general terms. I have in a number of instances written to the persons who have sent me such letters in this wise: "I have observed your commendation of A. B. is in very general terms. Is he a man of business integrity and experience? Is he a man competent to manage men? Tell me frankly and confidentially." In several instances I have received this reply: "What I said of him is true. But if you mean that and that, as you now specify, it is not true." In one instance I received a letter of commendation of that kind, and I knew the gentleman in the West who sent the letter, and I wrote to him saying I wanted to know confidentially about that man. He wrote back, "He lives in another town; I gave my letter from my general knowledge of him." I said, "Go to that town at the expense of our association; make thorough examination, and tell me whether he answers this description." He went, of course, but made no charge, and the reply was, "That is not your man"; and I sent him back his papers, and he was not appointed. Such are the efforts on the part of those religious bodies, with no motive except to get good men. These credentials, when we get suited, we send to the department, and then the department has a chance to look them over and make further inquiry, and then, if satisfactory, they send them to the President, and the President nominates, and the Senate afterward confirms if they see fit. Beginning away down at the bottom, with conscientious, religious, earnest men to carry it on—with that grand idea adopted, with that generic idea before this nation, and with the intention of making these Indians what they ought to be, educated, cultured, and prosperous men—it seems to me that that idea carried out would be much better than turning the bureau over to the War Department.

AGENTS NOMINATED BY THE RELIGIOUS DENOMINATIONS FOUND TO BE UNSATISFACTORY.

Q. Have you ever had occasion to turn out any of the men whom you have had appointed, or ask them to resign?—A. O, yes; I want to say we do not always succeed. There is one man we nominated a while ago who is not competent. I do not know that he is dishonest. There are charges of that kind. I am sure he is not competent, and he has sent in his resignation, and his resignation has been accepted.

Q. What I was trying to get at was this: whether you have the right to decide upon a man's qualifications, or whether the department decides for you and you fill the place.—A. After he is appointed?

Q. Yes.—A. When we have sent in the nomination to the department our responsibility ends. If he is accepted he becomes a government officer, and we have no further control over him—no more so than anybody else. I have, in some instances where reports have come to me that this man has done this and that, written the department, only asking that that man's scalp shall not be taken until he has had a chance to defend himself. I do that because I was instrumental in getting him appointed. Beyond that we have no control over them. In case a man appears to be incompetent, in the opinion of the department, they send us word that that man must resign or these charges be disproved; you may name a successor. We have no control beyond the simple nomination.

By Mr. McCREERY:

Q. Where do you reside?—A. In New York.

LINDELL HOTEL, SAINT LOUIS, MO.,
September 27, 1878—10 *o'clock a. m.*

JAMES M. HARWORTH affirmed.

The CHAIRMAN. We are taking evidence in regard to the feasibility of the transfer of the Indian Bureau to the War Department, and I learn that you have had considerable experience among the Indians, and may have got some valuable information which will be of use to the commission in its deliberations. We would be glad to receive any information which you may wish to impart to us, and you may proceed, if you please, to make a general statement.

PROGRESS OF THE INDIANS AT FORT SILL.

The WITNESS. I have acted in the capacity of Indian agent for five years, and had charge of the Kiowas, Comanches, and Apaches, belonging to the agency near Fort Sill. When I took charge of them in 1873, they were without any fixed habits of industry, or anything of the kind, and were really the wildest of the blanket Indians. After being with them for five years, I was able to start them on "the working-road," as they term it. At first it was with some difficulty that they were persuaded to work, or to get to work, but after they commenced they seemed to take to it and to enjoy it. I suppose that they were not harder to get to work than any class of white people raised in idleness—the younger men, for instance, raised in cities, who have not been required to work. In 1874, or the spring of 1873, we put in some corn, and got the Indians that year to go to farming. That was the first year in which I took charge of them. That year we plowed up and fenced lots for them, and they cultivated the fields themselves, and raised a small amount of corn. The next year there was considerable trouble. We had what we might term a little Indian war there which broke up the industry for a time. A good portion of them commenced farming that spring. The next year they put in some five hundred acres of corn, and raised over 5,000 bushels of corn. They put in over five hundred acres. In 1875 they raised more than 5,000 bushels of corn. In 1875 we put their children to school.

DESIRE OF THE INDIANS TO SECURE AN EDUCATION.

The children, I can say, learned very fast—as rapidly as white people would under the same circumstances, and with the same opportunities. After having been in school for a year and a half, the boys, say from twelve to fourteen years of age had advanced sufficiently to be able to add up, for instance, long columns of figures, footing up in the aggregate into the hundreds of millions, and to do it rapidly. In other things I think they did equally as well. I might say, however, that when I first took charge of the agency, the Kiowas and Comanches were a great many of them out, and the school was then made up of Caddo children from the agency adjacent to the reservation. Of these boys, I put into the shops some carpenters, some blacksmiths; those were the only kind of mechanics we had there; and one boy in particular, that I think of now, learned so fast, and did so well, that we had him make a box for exhibition at the Centennial. He went to the lumber-yard himself, selected the material in the rough, and manufactured the box, finishing it completely himself, putting in the side drawers, &c. It was a very nice box, and handsomely finished throughout, with side drawers and everything of that kind. We had this box sent to the Centennial, and it was regarded as worthy of a medal by the committee who examined it. It was Indian work, but it was as nice as a great many cabinet-makers would have made it. It was made without a nail being driven in it. I speak of this to show that they can learn as well as white people. As I said, the children at school learn as rapidly and readily as white children would under the same circumstances.

AGRICULTURE AMONG THE INDIANS.

When I first got them to farm—the wild Indians, the Kiowas and Comanches—I made a rule that no woman should go into the field to work. The work had before that been done by the women, always, but I made a rule that no woman should go into the field at all; that the men should do the work; and I allotted a certain field to the Kiowas and another field to the Comanches. That spring the Kiowas cleared off the ground in their field, picked all the weeds and everything of that kind off, and plowed the ground themselves for about two hundred acres. In that field they did all the plowing. We had no oxen, as Father Wilbur spoke to the commission about last night, but we had a little broncho or Mexican mule to work with. It would take three Indians to one team, an Indian for each mule, and an Indian to the plow, but they learned, I think, very rapidly. They had good crops that year generally. The next year I had to break over the rule a little of confining the work entirely to the men, and at times I had to let all go into the field to work.

INDIANS CAN BE MADE SELF-SUSTAINING.

By the CHAIRMAN:

Q. You think that with proper care and attention and proper treatment, they may be made self-sustaining after a while?—A. There is no question whatever as to that, in my mind. My observation with these people leads me to be fully satisfied of it—that they would be self-supporting. I had, for instance, a very wild Comanche, who was very bad—a Mexican-raised Comanche. I put him on a separate place, and that man has, in three or four years, built himself a nice house, and I think he has nearly fifty acres of corn. He has a little band of Indians with him, and does not do all the work himself.

HOLD PROPERTY IN SEVERALTY.

Q. Have your Indians advanced far enough to show any disposition to favor a division of property and hold it in severalty?—A. Each man owns all his own stock. The cattle, of which we issue to them a large number annually, are owned in severalty. Each man has his own branding-iron and his particular brand is put upon the cattle and horses. They have their cornfields and everything of that kind in severalty.

By Mr. McCREERY:

Q. Do they hold their stock in severalty?—A. Yes, sir; own all their horses in severalty. Take their cornfields, for instance—they were divided. We would give to each head of a family from five to eight or ten acres, and there were perhaps two or three who got on a ten-acre piece and held it in common, but nobody else had any right except the partners. It might be, however, a single man taking a lot.

Q. How far is your agency from Fort Sill?—A. About a mile and an eighth. The agency is scattered a good deal. The buildings, proper, of the Indians are about two and a half miles, and the farm about one mile from Fort Sill.

INDIAN POLICE, NOT THE ARMY, NEEDED AT AGENCIES.

Q. Is there any necessity for the troops being near the agency?—A. That is owing to circumstances. I think that troops could be dispensed with entirely upon this reservation by establishing an Indian police. My recommendation on that point was perhaps a pet idea of mine of having a police force, which I have had for several years. Last year, I believe, it was incorporated in the bill—there was a clause in the appropriation making an allowance for an Indian police. My idea was to take, say, thirty Indian police, with two white men, and divide them into two bands of fifteen each, keeping one all the time in the neighborhood of the agency for any emergency that might arise, and the other fifteen constantly patrolling the country, and in that way keep out horse-thieves and whisky-pedlers. Most of the difficulty arises from outsiders, such as whisky-pedlers and horse-thieves.

KIOWA AND COMANCHE INDIANS PEACEABLE.

Q. Do the Comanches and Kiowas make any depredations upon the Texas frontier?—A. They have not, lately; not since the spring of 1874. I believe that was the last; that is, I mean the agency Indians. There are a few Comanches, perhaps fifty in number, still out on the "Staked Plains," that, I presume, commit depredations, although I have not seen any publication of any except those claimed from Mexico. The agency Indians were enrolled, every one above 16 years of age. I enrolled them and issued rations every seven days, and issued to the heads of families. Some of the families were small; some only composed of two persons, and some are composed of five or more. The rations were issued to them regularly every seven days.

Q. Was there good discipline at the fort?—A. Very good. The duty of an agent (as the matter was spoken of last night) is a good deal more than simply the official work of it. The agent is to have charge of the general work—all the work must come under his notice, and he must be the director of it, and make it successful in every way; that is, the working part, as well as everything else connected with the agency. The Indians are just like children, so to speak; they look up to the agent just as children do to their father for example and for what is to be done. His word is to them the law. They look to him, and through him to

the authorities at Washington. He is the one whose influence is greatest with them, and hence the necessity of selecting a man for the place and not the place for the man. I think there is a great difference in making simply an agency for the Indian, and in having the Indian adapted to the place. I think that is absolutely necessary to the success of an agency.

ADVANCE OF THE INDIANS IN EDUCATION AND AGRICULTURE.

Q. Of what religious denomination are you, sir?—A. I am a member of the Society of Friends—of the Orthodox Friends. There are two divisions of the Society of Friends—one is the Hicksite, the other the Orthodox. The society had, I believe, eight agencies in all, but they have been reduced in number, so that there are but six now. When they took charge of the agencies, in 1868, there were but four schools, and in 1875 they had increased to fifteen schools. There were 105 scholars in the schools in 1869, and these increased to about 900 in 1875. Such are the statistics as I now have them. I just made a little memorandum this morning of the statistics. The increase of land cultivated and of the productions of grain and everything else has been in the same proportion. In 1868 there were cultivated in all the agencies about 3,220 acres of corn. In 1875 there were 14,500 acres in cultivation. In 1868 they raised 31,000 bushels of corn; in 1875 they raised 325,000 bushels.

Q. How far is your agency from Vinita?—A. It must be from 250 to 260 miles. The nearest point to that agency by rail is Caddo, 20 miles above Denison. It seems to me that it would be a good idea for this committee to visit those reservations. The Modocs are the most famous Indians, and you could easily get to them. The Nez Percés are located there with them at the same agency, and you could reach them at the same time.

INDIANS WILLING TO WORK.

In working with these Indians I believe I can say, after the first start, I never had any particular trouble in getting them to work. They were always willing, after they were instructed how to go to work, to go at it, and I never had an Indian to tell me that he would not, when I had instructed him what to do and told him to go and do it.

Q. You succeeded, then, in getting work out of the males rather than the females, I suppose?—A. Yes, sir. Last winter, along in January, I told them that they must commence getting ready for their farm work, and I went to the woods with them to show them what was to be done and how to go about it, and to work with them, and they made over 40,000 rails on or before the first day of March following. The exact number of rails they made I do not now remember; but it was at least 40,000. Many of them have made their own rails, and fenced in their own grounds and fields. I have one man, who occupies a field of nearly thirty acres, an Indian, who hauled the rails and put up his own fences. It was solid, unbroken ground, and I had it plowed for him. After that he and the other Indians plowed the ground for themselves and planted it. I located the Indians in small communities, with an idea of establishing district-schools among them—a district-school in each district or community. When they went there they did not have much of an idea of the distinction between the days—in fact, had no idea whatever. But they learned to respect the Sabbath day, and would inquire when the Sabbath day came, saying that they did not want to move or to work on that day.

Q. Are they living in tents yet?—A. Some of them are, and some are living in their own houses.

INDIANS RELIGIOUSLY INCLINED.

By Mr. BOONE:

Q. Do they attend public worship?—A. Yes, sir; to quite a fair degree. When we first went there they had a very poor idea of prayer. We were in the habit of holding meetings in their camps on Sabbath afternoon, although our regular meeting was at half past ten o'clock in the morning. To these meetings many of the Indians came. In the afternoon we usually held meetings at the Indian camps. We organized an undenominational society. The members at that agency were not confined to the Quaker Church—there were Methodists and Congregationalists and others represented there, so we organized an undenominational church. We never took but one Indian into it, however, because we did not think that the Indians fully understood what was implied in the membership of such a church. There was one Indian that did understand, we believe, an old Comanche chief, and he was admitted because it was believed that he understood fully just what he was doing. I could have had at least from one hundred to two hundred of their names down for membership, but I declined to allow them to become members until I was sure that they could do so understandingly.

Q. Do other religious denominations hold meetings there in a spirit of opposition to the Quakers?—A. Not regularly. They do when they visit there, sometimes. We have always allowed them the opportunity, with one exception, I believe; the Mormons tried to establish a mission there, and I declined to allow them to do it for the reason that I regarded them as disloyal to the laws of the land.

REGARD FOR THE MARRIAGE RELATION.

Q. That was right. Have the Indians any regard for the marriage relation?—A. Well, not greatly different from what they have always had. They have their own peculiar forms of marriage rites. Their laws are very severe on that subject; and as we had no law that could reach them, they were never interfered with. I think it was just as well to allow them to have their own laws in that respect, as the penalties were very severe, and the protection of the chastity of their people well secured under the operations of their own peculiar laws.

THE LAW SHOULD BE EXTENDED OVER THE INDIANS.

The one great want of the Indians of the country is law. The law they are governed by now is the law of 1834, made at a time when things were very different from what they are at present, and it is not at all applicable to the circumstances and present condition of the Indian nations.

Q. In your efforts to teach them agricultural pursuits, do they acquire a fondness for it, or is it irksome to them?—A. There is the same difference with them as among white people; some enjoy it, while others regard it as irksome and do not want to do it. There is a story about a Comanche when he first started to work. The Indian has a great passion for an umbrella in warm weather, notwithstanding he will expose his head for days to the rays of the sun. They get these big red, white, and blue ones; and the story is told of one of these Indians that he was hoeing corn one day and holding an umbrella over him at the same time. He had on his blanket and breech-cloth, and held the umbrella with one hand while he hoed with the other. So the story goes; I do not vouch for its absolute accuracy, however. I only say it was so related. There are many of the Indians that really enjoy work, while others regard it as very irksome.

THERE SHOULD BE A PERMANENT FORM OF GOVERNMENT OVER THE INDIANS.

Q. What is your opinion, based upon your experience among them, of their capacity and disposition, as to the practicability of establishing a form of government over all the Indians?—A. I think it could be done. Of course, those I was with are among the wildest, and it will take them some time before they will sufficiently appreciate the law; but I believe that many of them are ready for it, and others will be in a little while. I think it is absolutely necessary for their protection that they should have some form of law. I think, too, that the time is coming when they should have the right of citizenship.

LAND SHOULD BE INALIENABLE FOR A TIME.

I think the government, in giving them land, should make it inalienable, at least for twenty or twenty-five years, to give them an opportunity of permanent ownership.

Q. Upon the whole, do you think that the Indians, so far as you have observed them, are advancing in civilization in civil pursuits, or are they retrograding?—A. I think they are advancing. I think their history for the last nine or ten years shows that they are advancing, in all quarters. I want to state that I am not an agent now. I have left the service. The locality I was in was very unhealthy, and I had malarial fever, which resulted in paralysis, and I found it necessary for my health to make a change of climate.

By Mr. McCREERY:

Q. Where are you residing now?—A. Near Kansas City.

H. L. HART sworn and examined.

By the CHAIRMAN:

Question. You have heard the statement to the other witnesses of the object of this commission. Anything you may have to give to the commission that will bear upon the question of the transfer—whether it would be better for the government or the Indians, or both, to make the transfer of their bureau from the civil to the military department—we would like to receive. We are gathering such information as will assist us in our deliberations on this subject. What have been your relations to the Indian Department?—Answer. I am agent for the Apache Indians in Arizona.

Q. Are you the agent now?—A. Yes, sir; at the present time. My appearance before this honorable commission is entirely unexpected to me. I came East on other business.

ADVANCEMENT OF THE SAN CARLOS AGENCY INDIANS.

Q. Your information ought to be valuable to us; and we would be glad to know what your experience has been, and whether you are making any advancement towards civilizing the Indians under your care and making them self-supporting. We want to learn whether there is a probability, under the present system, of making the Indians self-supporting, and at the same time of giving them such moral training as will make them good citizens. What has been your experience in this matter?—A. I will briefly give you an account of the San Carlos Ageney, the one that I am familiar with. These Indians—the Apaches—were at one time the worst Indians on the continent. They were notorious for crime. I have been their agent for thirteen months, about. During

that time no crime has been committed—not a single murder out of a population of 4,500. Before I went there there had been no work of any consequence done at all. Since my charge of them we have made twelve miles of irrigating ditches (we have to irrigate the soil to produce any crops in Arizona) and we have produced some sixty or seventy thousand pounds of barley, twenty-five or thirty thousand pounds of wheat, and harvested quite a quantity of pumpkins and melons and such kind of vegetables. The value of this work has been estimated to be about $12,000. It is their first effort—the first year of their experiment in farming, and it has proven very satisfactory to the Indians. They have enjoyed it and do enjoy it very much, and are truly proud of what they have done this year.

THE INDIANS DESIRE TO EDUCATE THEIR CHILDREN.

My principal object in going to Washington (I have just been to Washington) was to see about schools. In all their councils the Indians have talked about schools and about educating their children. They say they are satisfied that they will never be much more than what they are—they will stay on the reserve and obey my orders, whatever they may be, but they want their children educated to read, and educated like white people's children. They are very curious to know what is to become of them. They are suspicious all the time as to what their future is to be, and what they are going to do with them in Washington.

NDIANS OPPOSE THE TRANSFER AND THREATEN TO LEAVE THE RESERVATION.

Last winter, when they heard of the probability of the turning of their bureau over to the military department, they talked it over and objected to it very strongly, and became almost wild in their opposition to it. Recently I received notice from the Indian Department to have a council with all the chiefs, which I did before coming away, and reported to the office the result of it. The chiefs, of course, appeared, and spoke for their bands. They have fully made up their minds, if they are transferred, to leave the reservation and go to the mountains, and live as they have lived before. But still, if I go back and report anything favorable on that question—if I can report that they are likely to remain where they are—they will be satisfied and keep at their work on the reservation; but if they are turned over to the War Department, they declare their intention to leave the reserve and go to the mountains. If they do, it is my opinion that Arizona, with its rich mines, will be worthless, because, if the Indians turn into the war path, they will clean out the Territory.

Q. What number of Indians have you?—A. A little over 4,500. It is a consolidation of five different agencies. They are mostly Apaches.

Q. As to the consolidation, does that work well? Do they harmonize in the settlement of their affairs, or does it keep up a division and strife among them?—A. I have not endeavored to bring them very closely together. The Chiricamuas and Warm Spring Indians were brought in recently, and they are not so friendly. They have to come in once a week at least and draw their rations.

Q. Do you think it will help to wear away the trouble?—A. Yes, sir; to a great extent. We usually keep from forty to fifty police, and that is our entire proteetion, and all we have to look to. There is no military whatever within thirty-five miles, and the garrison there is very small.

Q. How long have you been with these people, did you say?—A. About thirteen months.

Q. Have you ever had occasion to call upon the military at any time?—A. Never. I have my police force, and it is just as efficient as any police force could be.

INDIANS OBJECT TO THE PRESENCE OF THE ARMY.

Q. And yet you are thirty-five miles from the military?—A. Yes, sir; in fact, the feeling is such between the Apache Indians and the military, that the Indians have become hostile pretty nearly every time that the military have come through their reservation. They do not want them on the reserve at all. We are obliged to have a military officer at our post to inspect our supplies, as that is the requirement of the law at present; but they do not like it at all. They think that an agent of the Indian Department ought to be there. For my own part, I feel perfectly safe myself, for I think I have the friendship and confidence of all my Indians.

Q. What objection do they express to the military officer inspecting the supplies?—A. He has to have one or two of his soldiers with him, and he is there himself, and there is that strong feeling against them. They say that they have been their enemies, and have killed all their band.

Q. It is simply a prejudice against them, then, on that account?—A. Yes, sir; a deep-rooted prejudice.

Q. On that account only, and not because of the conduct of the inspecting officer?—A. No, sir. Simply because they are soldiers; that is all. They say they have diseased their families, but I question its truthfulness, at least to the extent imagined.

Q. What do the Indians understand by this transfer? Do they understand if this transfer is made to the War Department that they are to be governed by the Army?—A. Yes, sir; that is the impression they have gained. They remember how they used to be treated under the Army, and they think the same results are to follow now.

Q. Has that impression not been made upon their minds by outside parties? Do not white men make that impression upon them?—A. I have tried to explain to them that they are to be kept where they are and have the rations issued to them just as before, and that they are to continue to live as they are now living.

THE PRESENCE OF A GREATER NUMBER OF TROOPS NECESSARY IN THE EVENT OF THE TRANSFER.

Q. Do you think it would be more necessary, if this transfer were made, to keep soldiers near the agency than it is now?—A. Yes, sir; I think it would.

Q. Why?—A. That feeling of theirs that they have against the military would make it more necessary; and it is very hard for them to change their views and give up their prejudices on this point. After they had been under the Army for a year or more and found that everything was working smoothly and satisfactorily with them, and that their fears and suspicions as to the military were groundless, they might, perhaps, be reconciled to such an order of things; but that would be a matter of experiment.

Q. This prejudice, however, has to be removed?—A. Yes, sir; it has to be removed.

Q. And you think you have stated the case as it really stands?—A. Yes, sir; I do.

By Mr. STEWART:

Q. I suppose it is very difficult to make them understand that when they are turned over to the War Department they are not thereby turned over to the Army?—A. Yes, sir; that is the way they look at it.

Mr. MCCREERY. They must think that the Secretary of the Interior would appoint a good agent and that the Secretary of War would appoint a bad one?

Mr. STEWART. Their prejudices toward the Army and Army officers cling to them?

The WITNESS. Yes, sir; that is their point. It is their prejudice.

Mr. STEWART. As the witness says, if they should have an experience of a year or two with an Army officer, and he should meet their expectations, he might be as capable, and efficient, and as acceptable to them as any agent that could be appointed from civil life.

By Mr. MCCREERY:

Q. You say that your appearance were before this commission was unexpected on your part?—A. Entirely so, sir.

Q. What circumstances led you to come here?—A. From my agency?

Q. What induced you to appear before this committee?—A. I was at Washington the other day, and the Secretary of the Interior told me that this commission was to meet here, and he said that if possible he would like to have me come before it and give my views. When I left my agency I had no idea of meeting this commission at all.

Q. Was it the Secretary of the Interior or the Commissioner of Indian Affairs that made this request?—A. The Secretary of the Interior.

Q. You came from Illinois?—A. No, sir; from Ohio.

By Mr. BOONE:

Q. Who was your predecessor?—A. J. P. Plumb.

Q. Were there any complaints against Mr. Plumb?—A. With the Indians?

Q. Yes, sir.—A. No, sir; I think not.

Q. Was he removed or did he resign?—A. I think he resigned. I had a little talk with him about it afterward, and he said to me that the pay was not sufficient, and he could not afford to remain there.

COMPENSATION OF INDIAN AGENTS.

By the CHAIRMAN:

Q. You receive a greater salary when there is a greater number of tribes under your care than when there is but one, do you not?—A. I get $2,000 this year; $1,500 a year was the former compensation. From the 1st of July I received $2,000 per annum.

Q. You think, then, that if the Indians were properly cared for, and had the proper kind of agents, and training, and education, that they would finally become self-supporting and make good citizens, do you?—A. I have no doubt but what I could accomplish that object with patience.

Q. I mean those under you. Of course, you do not speak for other tribes?—A. They have made great progress, and, I think, are in a fair way to make still greater. I know of thirteen white men that have been killed in the little towns around us; that is one a month for the thirteen months that I have been there; while during that time among the Indians there has not been a single murder in all that tribe of 4,500. I think our order is as good at San Carlos as at any other place in the Territory. There is no drinking; everything is quiet and everybody is perfectly safe,

THE LAW OUGHT TO BE EXTENDED OVER THE WHITES.

Q. What are your views in regard to extending the laws over the Indian tribes the same as over the whites—punishing them in the same way for the same offenses? Speaking from your experience, would you advise such a course?—A. I think there ought to be a higher law than the agency law.

Q. We are not particularly agitating that subject as a committee, nor taking testimony in reference to that; but I simply ask for your views, based upon your experience.—A. I think if any of my Indians committed murder, or any crime worthy of attention, that I should turn them over to the civil authorities of the Territory and let them deal with them as they do with white men. I have told them so, and I think it has been a warning to them, so that they have been a little quiet. They rather dread that matter of being turned over to anybody else than their agent.

By Mr. BOONE:

Q. If murder were committed on your reservation, have the Territorial authorities any jurisdiction over it?—A. I do not know that they have.

Q. How would you proceed, then, to turn them over?—A. I should make the effort; that was my idea, that I should attempt to turn them over and permit them to be dealt with according to the law of the Territory.

Rev. JAMES H. WILBUR recalled.

The WITNESS. I would be glad to make a few further remarks, if it please the commission. I thought it might be interesting to the commission to receive a brief synopsis of the wealth of our Indians at the present time. I made out a little synopsis this morning, and if it would please the commission to hear it I should be glad to bring it before them. It will be brief.

By Mr. MCCREERY:

Question. Are you a Catholic?—Answer. No, sir; I am a Methodist minister, and went to Oregon as a Methodist minister. I labored some fourteen years at Portland, in that State, and in other parts of the country, and then went into the Indian service.

I made a short communication in Washington, where I stated that our school raised fifty bushels of corn the first year, and they had it fifty thousand.

WEALTH OF THE INDIANS AT THE YAKIMA AGENCY.

The Indians of the Yakima Indian Agency in Washington Territory were taken from the war-path in the year 1856 and gathered upon the said agency in the fall 1860. They were then very poor. They now, as nearly as I have been able to estimate it, have property as follows (of course I can only make an estimate): I ran their cattle through the branding-stall last June a year ago, and calculating the increase that they have had and what they have sold and consumed, I calculate that they have now some 4,000 head of cattle, worth, say, $15 apiece; I take them of all ages, and estimate them at $15 per head, making a total of $60,000. They have 17,000 horses, and I put the horses at $15 per head, making a total value for the horses of $255,000. They have 10,000 acres of land under fence; I estimate that this fenced land is worth $3 per acre, making a total value of $30,000. They have 6,000 acres of land under cultivation, with houses and barns and improvements upon it, which I estimate to be worth $8 per acre, making a total of $48,000.

They have 50 wagons (they have more wagons than that—they got 100 wagons, but I estimate it at 50), worth, say, $60 each; most of these wagons are new, and they are worth really more than that; at this low estimate they would make a total of $3,000. They have a hundred sets of harness, worth, say, $15, making in all $1,500. They raised 42,000 bushels of grain this year, which I estimate at 50 cents a bushel; wheat, barley, and oats, taken altogether I estimate at 50 cents a bushel; making $21,000. They have also 500 tons of hay, worth $5 per ton, an aggregate value of $2,500. Three hundred thousand feet of lumber, at $25 per thousand feet; and I estimated the lumber before we selected it out and stacked it up, and we call it worth $15 at the mill, and something like 100,000 feet of this lumber has been planed and grooved, and made all ready to put into the houses, so I estimate it at $25 per thousand. We built eight houses during the summer, worth $300 each, making $2,400, and we built one barn at the station, 45×75 feet, with a stable underneath, and the upper story for a hay-loft, which I estimate at $2,000. Adding a story to the boarding-school, $1,000. This building is 50×30 feet, and I took off the roof and added an upper story, finishing it up, laying the floor and putting on the ceiling and roof, and I estimate it at that amount. Cutting and hauling three hundred cords of wood to the station, at $3 a cord, makes $900. I mentioned last night that we had built a steam saw-mill, and I desire to explain a little further in reference to that mill. The Commission may perhaps wonder how we got money to build a steam saw-mill. As I said, the department did not appropriate a cent of money for the building of that mill. We have an excellent grazing reserve, and before we had stock, or before we had as much as we have now, the stock-grazers around the reserve were anxious for us to take the stock and keep them for them, they paying us so much a head for keeping them. I consulted the Indians, and they were willing and anxious to make the arrangement. With the money thus acquired we bought the machinery for the steam saw-mill, and then the Indians went to work and hauled in the machinery, some sixty-five miles, and as I said last night, I went into the woods and camped with them, and helped them about erecting the mill.

Q. The mill did not cost the government anything?—A. Not a dime. It is a mill that will cut a thousand feet of lumber in an hour—and more than that, if it is coarse lumber; but take fine lumber and it will easily cut a thousand feet in an hour. We can plane 8,000 feet of lumber with the planers, and make as many as 15,000 shingles in a day, and the whole thing is done by the Indians with the exception of two white men. Sometimes I have had but one white man whose business it was to stand by the lever, and all the other work was done by the Indians; and with an expense of fifty dollars a day I can make two hundred dollars' worth of lumber, using the Indians.

MARRIAGE RELATION AT THE YAKIMA AGENCY.

Q. Complimentary, I must say.—A. The Indians of the Yakima agency are most of them married. I urged them to put away a plurality of wives when I first went among them, and they have to a very great extent yielded to my wishes in this matter. I have married more than two hundred and fifty couples of the Indians, and many headmen of the nation have been married. In reference to their religious habits, I believe I stated last night that we have a church membership there of between five and six hundred; we have two good church edifices, and the people are as orderly and well-behaved in church as any people I have ever been with. I have never known any people more so. We

have had camp-meetings there, and they put the white people who come in from the country around to shame by their superior behavior.

Q. How far is it to the nearest station of troops?—A. About one hundred and fifty miles.

EXTRAVAGANCE UNDER MILITARY MANAGEMENT.

I remarked last night that during the eighteen months that our agency was turned over to Lieutenant Smith the agency lost some forty thousand dollars. It was in this wise: I confess I was ignorant at the time I turned over the agency to Lieutenant Smith. I thought he had to give bonds as I did; and when I was ready to pass over the property, I inquired of him if he had his bond. He said that he did not have to give a bond; he did his work on his honor, and I found that that was so! and of course I could not require a bond of him. But while he was there, there was a sutler's store, and he and the sutler would engage together in the purchase of cattle from the Indians. I speak understandingly. The law was that no cattle should be sold to outside parties. They were driven to the station and he, Smith, would put the price upon them, and they were sold to the sutler. Oxen that I bought when oxen were high, and they were needed while he was there, if the work was to go on—oxen were bought for two hundred dollars a yoke which he sold to the sutler for fifty dollars a yoke, and there had been no diminution in the price of cattle, but it was in the spring of the year when grass was abundant, and there was no danger of losing the cattle by reason of a want of pasture for them, or anything of that kind. The cows and calves that were worth forty dollars a head were priced by him to be worth twenty dollars, and sometimes as low as fifteen dollars; and then they would be paid for in goods out of the sutler's store, at high prices, to the Indians. And during the time that he was there, he gathered quite a herd of cattle, and he did it all on his honor! there were no bonds required.

By Mr. STEWART:

Q. He made money by these transactions?—A. I suppose so, sir. I know that that was so. I am prepared to prove what I say. It is not hearsay. I went up there by order of the department, to take charge, in June. It was understood that there was a sinking-fund there, and I was ordered to go back there and take charge of the agency in June. Indeed, it was in April when the information first came desiring me to go and take charge; but there was a man that was in charge of the agencies in Washington Territory, Colonel Ross, who was superintendent of Indian affairs, and I had become somewhat acquainted with Colonel Ross and knew that he was an honorable man in the Army. Yet he was not exactly my style of man—he would drink and swear, and was rough—and I made up my mind that he would make it hard for me if I went back, and I deferred from April to June, and then told Colonel Ross that I was ready to take charge of the agency. In accordance with the instructions that I had received from Washington, I went up to take charge of the agency, but they did not know me when I got there. I had letters of authority from the Commissioner, but Lieutenant Smith shook his head, and said that he would not have anything to do with it—that he had received no orders through Colonel Ross, and he would not let me take possession. I went back and staid until the 1st of January, and went up again, and Lieutenant Smith had gone to San Francisco some two or three months previous, and had left a drunken fellow by the name of Van Hinkle there, and when I went back to take charge of the

agency Van Hinkle said that the thing could not be turned over until Smith came back in the spring. This was the 1st of January. I said I had been up there once and went back, and that I had come up now and was not going back again—I was going to take possession of the agency. He said that they would not turn over the property to me. I said I did not care a fig whether they did or not; I would make out new property returns, if they did not choose to do so; that I would take up what property I could and make up a new property return, and that I was going to have the goods and take charge there. I did take charge. I at once went to work and discharged some of the employés that were gambling, dishonest, profane men, and who would spend their time idling there at the reservation. In referring to these matters I must not be understood as having any feeling against the Army; I have no animosity whatever toward military men—I simply speak the facts as I know them.

By Mr. BOONE:

Q. What became of Lieutenant Smith?—A. I do not know. I have never seen him since I got there with the papers. He was a very feeble man in health; he was the least calculated, so far as health was concerned, for such a position. He wanted a man to take care of him. He lived in my family two or three weeks, and needed nursing all the time, and had no capability for managing anything.

QUALIFICATIONS OF INDIAN AGENTS.

I do not want to bore the commission by taking its time with these matters, but I was going to say that we do not want in the Indian service any superannuated men, whether from the ministry, or from the store or from the shop, or from the farm, nor do we want in that service any superannuated men from the Army—the colonels, majors, captains, or lieutenants. We want whole-souled, thorough-going men—and if the Indians are brought up to what they may become, we have got to have such men—and we must get them from this country if they are procurable here, and if they cannot be procured in America, we ought to get them from some other part of the world. I have been connected with the Indian service so long and so intimately that I know their customs, their language, their habits, their practices, and all about them, well. I have been studying them for eighteen years. I know that there is a class of men among the Indians that will get right down to hard manual work without grumbling, and I know that they can be made self-supporting; and it is my judgment, after long experience in Indian affairs, that we ought to dispense with these little one-horse agencies, and consolidate them into one.

AGENCIES SHOULD BE CONSOLIDATED.

We have got agencies scattered around where there are only three or four hundred Indians, and the expense to the government has heretofore been as great to take care of three or four hundred Indians as it has been to take care of three or four thousand. And these agencies are very frequently located right close to a town where there is a pestiferous influence like the Upas tree to destroy the Indians. They ought to be consolidated upon a reserve where there is land and timber and water enough, so that they will remain comparatively free from the great thoroughfares of our country. By putting in the right sort of men the Indians can be governed and brought up without wars or trouble. I believe it as much as I believe that I know my own name.

TROOPS NOT NEEDED TO GOVERN THE INDIANS.

By the CHAIRMAN:

Q. You do not think then that there is any necessity for troops after the Indians have been once broken in by proper treatment?—A. No, sir. Mr. Jerome and General Howard went as a commission to see about moving Joseph, the Nez Percé Indian; that will be two years this fall, I think. They went up there and they did not succeed in their commission as they had hoped, and they came into our agency, sixty-five miles as they claimed, and talked with me, asking me what course I thought ought to be pursued by them, as they knew that I had been a long time connected with the governing of Indians, and felt that any suggestions would be of some value. I then told them there that Joseph ought to be taken on a Nez Percé reservation, but that by all means he ought to be taken in the winter, after the snows had filled up the cañons and the mountains were covered with snow, when there was but little buffalo for him and his people; and if he would not go on the reserve, take him and his men that fight with him and move them clear away, and the backbone of their resistance would be broken and his people would go right on the reserve. And I said further to Mr. Jerome and to General Howard that I believed I could take ten Indians from my agency, and without firing a gun accomplish that work. But the removal was deferred until the grass grew, and the cañon passes were open, and they had a wonderful chase after Joseph.

We had a case on the Columbia River that it seems to me bordered very much on the case of Joseph. A young man by the name of Socomish had five hundred wild Indians about him, and he was not going to give up his land, and he was not going on the reserve. I had a conversation or two with him, and finally went out to his camp, and there were about forty-five of his men there at the time I went there, and I said to him, "I have come now to know what you are going to do—whether you are going on the reserve, or whether you are going to refuse to do so." He said that his mind was made up not to go on the reserve—that he would not go on the reserve. "My mind," I said to him, "is that you are going to go on the reserve." He still refused, and I said to him, "Then come to Fort Vancouver, and I will turn you over to the soldiers; and unless your people come on the reserve, and make up their minds to go to work on the reserve, you will never come up the Columbia River again; you will go to the Indian Territory." I took him by the collar and marched him to the cars, took him to Fort Vancouver and turned him over to the military. I came back after two days; his Indians went on the reserve and they have been just as orderly as any Indians we have had on the reserve. If I raise my finger at them they are ready to go and to come at my beck. Now, what is needed among the Indians is a man who is acquainted with them, that knows them thoroughly from head to foot, and if we get such men the Indians can be gathered and consolidated on a reserve without war and without any great expense.

Q. You find that kind treatment is received by them with appreciation?—A. Yes, sir; I never say to an Indian, "Do this," but what I make him do it. I never back down; never in the world. It would not do. I do exactly with them as I used to do when teaching school. I would have a few rules, but I would have those rules obeyed, and I never had any trouble in governing them.

CONSOLIDATION OF AGENCIES.

Q. The question has been raised, although it is foreign to the matter which the commission has under consideration, as to the advisability

of consolidating the Indians into fewer Territories. I notice that you have an idea of consolidating the Indians to some extent in their own neighborhood; does this extend only to small parts of the country, or do you look into that matter with the view of bringing them together on large reservations, and but few in number?—A. My idea is that we ought not to have in California, Oregon, Washington Territory, and Idaho more than four reservations, and we have got now some twenty, perhaps. Our reservation is forty by sixty miles in extent, and a good deal of it is mountain land, having on it excellent timber, and a residue of lands enough for cultivation to support some twelve or fifteen thousand Indians, and to support them well. My idea is that they would be better off. I have not been forward to speak about their being collected on our reserve, because it would seem as if I wanted to be king in the affair; but it does seem to me that the true way is to put the Indians where there is good land, and where they can get good houses and farms, and they will be encouraged to work themselves up and to become self-sus-taining.

I will make one further remark, and then I am through. I fenced in with posts and board fences some three or four hundred acres in an oblong form—made it about a hundred rods one way, and then long enough the other to take in three or four hundred acres of land. I got the Indians to help me about cutting the logs and getting the lumber, and in making the fence. I would say to them, "Go to work now and help build this fence, and when it is done you shall have a farm in this inclosure." My object is to get a good fence so that if they put in crops they are not destroyed by the stock; and I help them about breaking the land and help them to seed, and when that is done they have a place in the inclosure if they have earned it by working for it. They run a fence through the inclosure, and we check off about forty acres for this one and forty acres for that one, along in sections, on both sides; and we get started in that way, and they go on and cultivate it in quite a satisfactory manner.

By Mr. McCREERY:

Q. Is irrigation necessary?—A. We have to irrigate some. Fall grain comes to maturity without irrigation.

By the CHAIRMAN:

Q. Have you spoken about the distribution of landed property, and holding it in severalty?—A. Yes, sir; I remarked last night that they cultivate in severalty, but they have not got their title to their land.

Q. It is a mere reserve?—A. Yes; the land has been surveyed, but it was after they had settled on the land.

Q. Has this land been allotted to them by treaty relations?—A. Yes, sir; by treaty. It is theirs perpetually. They are to have so many acres for a man and his wife, and the government has promised to give them a title or patent to the land.

The Commissioner desired me to stop here on my way from Washington. I suppose there is nothing further that this commission desires of me.

CYRUS BUSSEY sworn and examined:

The CHAIRMAN. General, we would be pleased to listen to a statement of your views upon the subject under consideration by the commission, as to the propriety of transferring the management of the Indian Bureau from the Interior to the War Department.

INCOMPETENCY OF CIVIL ADMINISTRATION.

The WITNESS. I would say to the commission, that I have give considerable thought to the subject of the transfer of the Indian Bureau to the War Department, from the fact that in 1864, as an officer of the volunteer service of the United States Army, I was assigned to the command of a division embracing the Indian Territory and a large part of Arkansas, with headquarters at Fort Smith. At that time I had under my command a brigade of Indians, three regiments commanded by Col. Wm. A. Phillips ,who is now in Congress from Kansas. In consequence of the derangement of affairs produced by the war, it was found to be impossible for the Interior Department to carry out the contracts through the superintendent for the support and supplying of the Indians as had formerly been done, and it became necessary for the military authorities to assume the duty of subsisting the Indians, and about 20,000 Indians were placed under my charge, and I subsisted them for about 9 months through the military channels. When I went to Fort Gibson, on the first visit I made to the Indian Territory, I found a camp of fully 15,000 Indians. They were at that time entirely destitute of everything to eat except beef cattle, which they drove in and slaughtered. There was not a bushel of grain or a pound of breadstuffs to be had to feed those Indians with. I took with me a steamboat load of provisions and distributed to them.

DISHONESTY OF CIVIL EMPLOYÉS.

I was also brought in contact with the superintendents, agents, and contractors, and found that a vast amount of corruption existed, and that the government had been swindled to the amount of millions of dollars during the two or three years preceding by the frauds that had been perpetrated—getting double vouchers for the subsistence furnished, and in many instances triplicate and quadruple vouchers for the same subsistence—and I became convinced that under the policy the government was then pursuing not more than 25 per cent. of the appropriation made ever reached the Indians.

I am not prepared, even with the information which I have, to make a recommendation in reference to the transfer. I am more than ever convinced that the government requires that the Indian Department should be controlled by men of unimpeachable integrity; men who will go to that country with the intention of preventing wrong of every kind upon the part of the white people, and of seeing that the orders of the government are strictly carried out, and the allowances of the government properly and honestly distributed. Whether that can best be done through the Interior or the War Department I am not as yet prepared to say.

INDIANS CAN BE INDUCED TO WORK.

I heard the statement the other night of Mr. Wilbur, in reference to inducing the Indians to work. I have had some little experience in that line. When I first visited Fort Gibson I was met by a delegation of the different tribes of Indians, who were anxious I should say something to them. In order to gratify their desire, I called together a meeting of their headmen, which was attended, in fact, by nearly all the male portion of the Indians assembled there, and made a little address to them, in which I endeavored to impress upon them the necessity of their earning their own subsistence, which I felt confident they would be able to do by a little effort, as they own and have the finest country in the world. Seven or eight different tribes were represented. They had interpreters, and what I stated to them was interpreted to the various tribes in their own

language. I offered them seed corn, potatoes, garden-seeds, and anything in fact which they would put in the soil, with such facilities as the government could place at their disposal for cultivation, and guaranteed protection to the extent of the capacity of the military of the post. I assured them that, as that was planting season, it was necessary for them to raise a crop, and if they failed to do so, the responsibility would rest with them, and they would starve. The result was, that under the influence of Col. Phillips, of whom I cannot say too much, and who is one of the very best officers I ever came in contact with in the service—a man who thoroughly understood his duty and carried it out—a very large crop was planted, which raised sufficient to subsist a large part of the people who were gathered there during the summer and winter of the following year, which very much lessened the assistance required from the government. I heartily indorse everything Mr. Wilbur said in reference to the labor question.

INDIANS CAN BE MADE SELF-SUSTAINING.

By the CHAIRMAN:

Q. Do you think the Indians could be made self-sustaining by proper management?—A. Yes, sir; I believe they could. I believe if the Indians were under the control of conscientious, earnest men, who had their good at heart, and who would devote themselves exclusively to that work without any regard to the amount of money to be made out of it, the time would come when they would be self-sustaining.

MONEY SHOULD NOT BE PAID TO THE INDIANS.

Q. There is one point which we have not touched upon in the examination of other witnesses, but upon which we would like to have your opinion and the opinion of gentlemen who have had experience in the Indian service. Do you think it good policy to pay money to the Indians, or would it not be better to furnish them with the necessaries of life and facilities for working?—A. I do not think the Indians ought to have a dollar. I think it is wrong for the government to distribute money to the Indians, which is the cause of all the difficulty and corruption among them. It attracts a vagabond class into the Territory for the purpose of beating the Indian out of his money, either by selling him whisky, by gambling, or in some other manner. It does no good either to the Indian or the white man. That has been my observation. We have a great many vagabond white men going into the Indian Territory, who have lost all reputation in the States, simply for the purpose of getting the money distributed by the government to the Indians. If the government would give the Indians utensils to work with, and send men among them who would require work of them, I believe the time would come when they would become better civilized and self-supporting.

By Mr MCCREERY:

Q. You were among several tribes of Indians as an officer of the Army?—A. Yes, sir.

Q. Did you ever discover any apprehension on the part of the Indians for the virtue of their women on coming in contact with the officers of the United States Army?—A. No, sir; I do not think that that question was ever brought to my notice.

Q. They approached you whenever they chose, I suppose?—A. O, yes, sir.

Q. You formed treaties with several of the tribes, did you not?—A.

The last official act I did was to call a council at Fort Smith, at which there were representatives of twenty-two tribes of Indians. I notified the government, and a commission was appointed, consisting of General Harney, and other distinguished civilians and military officers. The commission assembled at Fort Smith and were in session some ten days. At that council I had an opportunity of meeting a large number of the Indians of the various tribes.

Q. Were you much among the wild Indians or principally among the civilized ones?—A. We had the Osage and a number of other tribes of semi-barbarous Indians. Of course the Choctaws, Chickasaws, Cherokees, Seminoles, and Creeks are more intelligent and civilized, because of the large number of half-breeds among them; and there are a large number of those Indians who are well-to-do farmers—own valuable tracts of land; have thousands of heads of cattle; raise a large amount of cotton, and are really intelligent men; and it may be the nucleus, with proper management, of the civilization of other large tribes of wild Indians.

THE CONSTRUCTION OF THE NORTHERN PACIFIC RAILROAD WOULD AID IN PREVENTING INDIAN TROUBLES.

I would like to make a suggestion here; I don't know as it is pertinent to your investigation. It strikes me that this Indian question, which has engaged the attention of the country for a hundred years, and will continue to engage it for another hundred years unless there is greater advancement and more rapid improvement in the methods of treating the question than there has been in the past, either under the Interior or War Department. It is a well-known fact that the Indian question has cost the government hundreds of millions of dollars and is costing the country hundreds of millions of dollars. It strikes me that the completion of the Southern Pacific Railroad, which would open the country to settlement, make it more difficult for the Indians to commit depredations and get away, and make it possible to concentrate force sufficient to suppress outbreaks without such vast expense to the government, would be the best investment the country could make, and would do more to settle the Indian question than anything else that could be done.

Q. I believe you said you had not formed an opinion as to the superiority of the Interior or the War Department in the management of Indian affairs?—A. I have not for this reason: The Army is being cut down to such small proportions, that it is questionable whether they have men sufficient to meet the requirements and be ready for the military service which might be demanded of them.

Q. You think the amount of peculation and fraud would be lessened by the management of the War Department?—A. I have this to say for the Army: During my entire experience with the Army I never came in contact with an officer of the Regular Army in any official position, that I can now remember of, whose record was not an honorable one. I believe if the Army took hold of the Indian Bureau, that the officers of the Army would administer the trust confided to them with the strictest fidelity, and I believe every dollar of the money appropriated by the government would reach the destination for which it was intended. I have that much confidence in the Army of this country, and I base this opinion upon a very extended acquaintance in the Army. I believe the same would be true of the Interior Department if the civilians were selected for their capacity and integrity, and with the same care that men are selected to go to West Point and to become officers of the Army, but unfortunately that is not true.

Q. Are you connected with the Army now?—A. No, sir; I am a civilian. I have not been connected with the Army since the close of the war.

Q. Do you reside in Saint Louis?—A. I reside in New Orleans. I went into the Army from Iowa as colonel of a cavalry regiment; served for more than four years, and went out of the Army as brevet major-general.

ARMY OFFICERS AS INSTRUCTORS OF THE INDIANS.

By Mr. BOONE:

Q. There seems to be a doubt in the minds of some as to whether the Army officers would take the necessary pains and trouble to advance the Indians in agriculture, civilization, Christianity, &c. From your acquaintance with the officers of the Army what is your opinion, if the trust should be confided to them, as to whether or not they would be faithful in that regard?—A. Well, I think, judging from the variety of character and temperaments we find in the Army, that about the same proportion of the officers of the Army would become enthusiasts on that question as we find among the civilians. I believe that to a certain extent it requires an enthusiast—a man who expects to sacrifice himself for the good of those people—to bring them up to a higher civilization.

Q. Is there that degree of impatience upon the part of Army officers that some seem to imagine, in reference to instructing the Indians, or would they take as much care, on an average, as other people?—A. They do not differ at all from other people. They don't like to correct people a bit better than a civilian does, and my impression is they would evince quite as much patience, because the whole routine duty of an officer of the Army is one of patience.

Q. At an agency they have not only an agent, but also a blacksmith, a farmer, and men selected to superintend the different departments, do they not?—A. Yes, sir.

Q. It is, therefore, more particularly the business of the farmer to superintend the farming operations, and of the mechanic to superintend the mechanical operations, than of the agent?—A. Yes, sir.

Q. The efficiency of the agency consequently depends very greatly upon the character of the men chosen for those several positions?—A. Precisely so. There is not one agent in fifty who will do what Mr. Wilbur says he did—go out and take hold of the plow. It is not expected of him.

THE LAW SHOULD BE EXTENDED OVER THE INDIANS.

Q. What is your opinion as to the practicability of extending the jurisdiction of our laws over the Indians?—A. I have always insisted that it should be done. I think the one great mistake made by the commission down at the council at Fort Smith was that they did not consider the treaties that had been in existence as abrogated, and proceed to make new ones upon the basis of bringing the entire Indian country under the jurisdiction of the laws of the United States, the same as are enforced against the white people everywhere.

Q. It has been stated, and pretty generally charged in some quarters, that the contact of the Army with the Indians was detrimental to the morality of the Indians, especially of the women. Please give the commission your views upon that point.—A. Well, sir, I had an opportunity of judging upon that question. I had seven or eight thousand men, and fifteen or twenty thousand Indians under my control, and for the purpose of enforcing discipline I had a special corps of detectives, in citizen's

dress, and changing from time to time around through the camp, with authority to arrest at any time any soldier or officer that might be found out of quarters at night, and put them in the guard-house. During the time of that observation I had very few arrests made of officers or soldiers, but I frequently filled the guard-house with civilians.

Q. Those vagabond civilians who came in there—white people?—A. Yes, sir; scalawags who are always following around and hanging on every military post in the Indian country. They find some excuse to be there, but they are the people, as I said before, who create the difficulty.

CONTACT WITH THE ARMY NOT DETRIMENTAL TO INDIAN WOMEN.

Q. Is it not a fact that the trouble is generally attributed to these interlopers, vagabonds, and scalawags, rather than to the Army?—A. Yes, sir; I think so, sir. I am perfectly sure, judging from my observation, that the difficulty would not be any greater under a detachment of the Army than under the same number of civilians from any walk in life that would be likely to go into a Territory.

NO MORE SOLDIERS REQUIRED UNDER MILITARY MANAGEMENT THAN AT PRESENT.

Q. Would it require the presence of more soldiers among the Indians if an Army officer should be detailed as agent than if a civilian were appointed?—A. I think fewer.

Q. We have already a mixed jurisdiction and we do keep soldiers in certain parts of the Indian country. Your opinion is that the number of soldiers would not have to be increased among the Indians with Army officers as agents?—A. No, sir; I think not.

Q. From your observation of the capacity, habits, and disposition of Indian agents generally, and from your acquaintance with Army officers, is it your opinion that agents selected from civil life are any more capable of administering Indian affairs than Army officers would be?—A. I have had no experience in the last few years; but I earnestly hope that there is a better set than those I came in contact with from civil life. I have nothing good to say about them.

Q. In your intercourse did you find this general apprehension upon their part of being turned over to the War Department?—A. At that time the question was not discussed among them.

By Mr. STEWART:

Q. Do you think the whole question could be solved by the completion of the Southern Pacific Railroad? Would it not apply equally as well to the completion of the Northern Pacific?—A. Yes, sir; I believe it would apply with equal force.

Q. And you believe the completion of those two roads would solve the Indian question?—A. Yes, sir; it compels the people to become civilized just as the Indians living on the reserve in Ohio and in New York and the States that we have settled up have necessarily become peaceable citizens, so would the wild Indians on the plains, and be but one-tenth of the annual expense that they are at present; and the cost of transportation would be greatly reduced.

By Mr. HOOKER:

Q. At what point were you located?—A. My headquarters were at Fort Smith, Arkansas. I had the entire Indian Territory under my command and a large part of Western Arkansas.

Q. How did you find the five semi-civilized tribes—Cherokees, Choctaws, Chickasaws, Creeks, and Seminoles—at that time as to advancement

in civilization and agriculture?—A. Well, sir, in traveling through their country I found evidences of prosperity and wealth everywhere, and habits of industry on the part of a very large part of the Indians.

Q. That is of those tribes?—A. Yes, sir, of the five civilized tribes. They had a disposition to acquire education. They had good schools and churches and were really making progress in civilization.

Q. What was the period covering your being an officer?—A. From 1861, to October, 1865.

TRANSPORTATION BY THE ARMY THE BEST.

Q. What is your opinion as to the comparative expense of transport ingsupplies to the Indians through the process now in vogue in the Interior Department and through the commissariat and Quartermaster's Department of the Army; I mean as to the certainty of their reaching their destination and as to the cheapness of transportation?—A. There ought not to be any difference, but perhaps there is.

Q. What is that difference?—A. The arrangements of the War Department for the transportation of supplies are facilitated from the fact that at every station and every post they have warehouses for storing supplies, and officers in charge of them, and orders from one point to another can be executed very rapidly, because of such advantages as the establishment of these places gives them.

Q. The advantage then would be in the method of supplying by the Quartermaster's Department and commissariat of the Army rather than in the civil service?—A. Yes, sir; I think so.

PROSECUTION OF WRONGDOERS IN THE INDIAN SERVICE.

Q. You spoke of the wastefulness under the present system, and the fact that it was your opinion that not more than twenty per cent. of the appropriation reached the Indians. Have you any knowledge of any efforts having been made through the civil tribunals to call the agents to account?—A. No, sir; I have no knowledge of that fact. I referred to that department and the frauds coming under that jurisdiction, amounting to hundreds of millions of dollars.

Q. Did you know of the parties being prosecuted by the courts and brought to justice?—A. No, sir; not one. To give you an illustration: Where a party had a contract with the government to supply corn to the Indians at $7.05 per bushel, he being the lowest bidder, he went out among the Indians and he found an Indian with 200 bushels of corn, and he gave him $2 a bushel with a promise to give a part of it back, or at least enough to keep him from starving. He left that corn in the crib of the Indian, and went back to a detachment of Indians he was supplying, and gave them orders for the 200 bushels in the hands of this Indian, and took their vouchers as having supplied the Indians with 200 bushels of corn, for which he received $7.05, without having put a bushel of corn in the Territory and not having benefited the Indians beyond the supplies already there.

Q. You are familiar, of course, with the method of proceeding in the Army against an officer who is unfaithful to the duty devolving upon him?—A. Yes, sir.

Q. Would there be a summary proceeding against an officer of the Army if the duty should devolve upon him of carrying out the treaties of the government with the Indians?—A. If reported the officer would have to be tried. A charge of that kind would have to be investigated by military court-martial.

Q. And that would of course be far more summary than any civil proceeding?—A. Yes, sir.

Q. For the purpose of establishing this accountability?—A. Yes, sir.

INDIANS DESIRE TO CARRY OUT IN GOOD FAITH THE TREATIES.

Q. In the course of your experience in that portion of the country in which you had jurisdiction over the Indians, state to the commission what was the temper and disposition manifested by the civilized tribes with reference to carrying out in good faith the treaties made with the government.—A. They evinced a desire to do so to the fullest extent in every instance.

Q. Did they exhibit a reasonable intelligence with regard to their rights under these treaties?—A. Yes, sir; they seemed thoroughly to understand them—quite as well as white men.

I would like to say that I did not come before your commission from my own choice. I was invited here by the commission. I want that fact stated.

The CHAIRMAN. The commission were glad to hear from you, knowing you had had considerable experience.

By Mr. BOONE:

Q. Had you ever occasion, while you were in charge of the department that you spoke of, to examine the supplies that had been purchased and issued to the Indians by the Interior Department?—A. I did not find a solitary thing to examine. They had utterly and totally failed to supply anything, and the Indians were on the verge of starvation when I found them.

INDIANS COMPLAIN OF QUALITY OF SUPPLIES.

Q. It has been charged in certain quarters that even those things that were bought under contract and supplied to the Indians were of an inferior character, and sometimes purchased at exorbitant prices.—A. I can only say that was one of the complaints that was constantly being made by the Indians, that the articles supplied to them were inferior, but I had no opportunity of judging myself.

By Mr. STEWART:

Q. Have you heard any complaints within the past few years?—A. No, sir; I have had no connection with them for several years.

ROBERT CAMPBELL sworn and examined.

The CHAIRMAN. You have heard the object of our commission stated to the witnesses who have preceded you. We would be glad to have a general statement from you on the subject under consideration.

INDIAN BUREAU SHOULD BE UNDER THE WAR DEPARTMENT.

The WITNESS. I have always thought it would be better to have the Indian Bureau under the War Department than under the Interior, the troops being stationed at different parts of the Indian country, where agents would be appointed under the War Department, as was the case after the war, I believe it was. There were a number of officers detailed, and I was asking General Sherman as to the control over those agents. He said they could be tried for any neglect of duty, or anything that had been wrong, just the same as if they were in the Army, and that in this way anything that was done wrongly with the Indians could be reported at once, and an investigation made on the spot, where the proper proofs could be obtained. Under the Interior Department, where there

was any charge made, a committee was sent out from Washington or some other place to make an investigation, and I happened to be in a position where I saw several of these investigations. I was on the Indian commission formed by General Grant for several years, and I felt then that justice could be done better by having it under the control of Army officers, who had their commission at stake, their character at stake, and controlled by those who, if they had done wrong, would condemn them. I think it was the impression with the higher officers of the Army that they could control the Indians better and do more justice to them, being under the War Department, than under the Interior Department. President Grant told me himself that when he was General of the Army he tried to get a bill passed to have the Indian Department placed under the War Department; but he said he had not enough influence—the Indian ring was too strong. He said he felt he, as head of the Army, knew the Indians' wants and understood them well, and that he could do them justice.

By the CHAIRMAN:

Q. You think that the Army would be more suitable—would be better for the Indians, and more economical?—A. I looked upon it in this light: We were trying to better the condition of the Indians by buying the goods ourselves, and we learned that they were exchanged for inferior goods when they were taken to the interior. I thought an officer of the Army ought to examine all supplies that were delivered to the Indians, and, if necessary, an officer appointed to be with the agent, wherever he might be, to see the rations issued properly. The great complaint was that. But I was the only one on our commission, and there were ten of us, who thought it ought to be under the War Department. All the others were gentlemen that had had experience, and were very fine gentlemen. Mr. Brunot was one of the best men that I ever knew, and other gentlemen who had been selected by Grant, and who have shown their devotion to their country.

Q. Have you in your mind any better plan than either of those proposed here, any improvement upon the present plan, that could be made? That is a question which is being asked now in some parts of the country.—A. The changes are going on in regard to the Indians and their management so very rapidly that it would be almost impossible to give a correct opinion upon that. In the olden time, when I was among them, they were all wild tribes, and living by their buffalo and whatever else they could kill upon the prairie. Now they are being placed upon reservations.

By Senator MCCREERY:

Q. How long have you lived in this city?—A. If I live until the 3d October next it will be fifty-five years. I came here in 1823.

Q. Have you spent a portion of your time among the Indians?—A. Yes, sir; I was ten years altogether engaged among them. For four years I remained out among them, and did not come in at all—never saw a house in all that time.

Q. How long since?—A. I went out in 1825. That was from 1825 to 1829.

By Mr. HOOKER:

Q. What position do you say you held with reference to the Indians and the government?—A. I was on that unpaid commission. President Grant, when he came in, had a bill passed authorizing him to appoint ten gentlemen, who should serve without compensation, to visit

the Indian tribes, assist in the purchase of goods for them, and aid in their general management.

Q. What disclosures were made, if any, with regard to the fidelity of the agents in the disbursement of those goods when purchased, and what was the mode and method of purchasing?—A. The mode and method of purchasing was, when any articles were wanted a list of them was furnished and publication made by the Interior Department. A subcommittee of our commission attended in New York and had open bids and samples of goods furnished; all was open, and anybody who came could see them, and the awards were made on what was considered to be the cheapest.

INDIAN GOODS CHANGED BEFORE DELIVERY.

Q. With reference to the transmission of those goods to the Indians, you spoke a moment ago, if I understood you (perhaps it was some other witness), of the goods being changed. Were those goods transmitted just as they were bought by the agent?—A. When we bought the goods we then appointed a certain time for delivery. We had warehouses and had agents that we selected ourselves to see that there were no changes made, and when the goods were delivered we received, also, proposals for the shipment of them. When that was done the Indian Department or the Interior Department took charge of them and forwarded them. We had nothing further to do with them. Complaints were made and investigations were made, and I believe it was found that there were some goods—I recollect on one occasion a quantity of flour—delivered over to traders that were there. There was some charge of this, which we had not an opportunity to investigate. But we heard of bales of blankets, and things of that kind, being changed. These matters did not come under my observation. When we got any complaints of the kind we furnished them to the Interior Department.

PROSECUTION OF WRONGDOERS.

Q. Did you ever hear of the successful prosecution of any of the agents who have been thus charged by the courts of the United States?—A. No, sir; I think not. I do not recollect of any.

Q. Briefly and concisely, what are the reasons that incline your mind, from your experience, to decide that the War Department could more efficiently, faithfully, and economically administer the Indian Bureau than the Interior Department?—A. Well, sir, the agents that were appointed, especially during the war, took their agencies as far as they could conveniently from the military posts. They appointed their own relatives and friends as traders and in other employments, and the charges were made that they had used government goods to trade with the Indians. They would allow no person to come around or to trade except those of their own set. There, I thought, was an opening for very great fraud, and there is no doubt of it. Several gentlemen were removed. I think this was about the worst of it, during the war times, when they were too much engaged in Washington to be able to give attention to the matters of the Indians. My views differed from all my associates. I told President Grant when I was in Washington (he was always very kind and friendly, knowing I had been so long among the Indians) that I wanted these Indians that were brought in from the reservation, such as Red Cloud and his party, who came on to Washing and had conversations with the President and the department, taken down to those five nations—Creeks, Cherokees, &c.—who were far advanced in civilization, and left among them for a certain time, and

then they could go into their own country and among their own people, and tell them what advancements had been made. I said that these Indians should be kept away from the large cities, and taken down among the Creeks and Cherokees. He thought favorably of it; but t was never carried out.

Capt. A. E. WOODSON, sworn and examined.

By the CHAIRMAN:

Question. Are you an Army officer at the present time?—Answer. Yes, sir; I am captain of the Fifth United States Cavalry.

Q. Where have you been stationed lately?—A. I have been stationed in Kansas, Colorado, Arizona, and Wyoming.

Q. Have you been near Indian agencies most of the time?—A. Yes, sir; I have been in the vicinity of agencies since 1859.

Q. Have you paid some attention, since it has been discussed in Congress, to the subject of turning the management of the Indian Bureau over to the War Department?—A. Yes, sir.

Q. What conclusions have you come to, and what reasons have you for those conclusions?—A. My opinions are based upon personal observation both as to the manner in which the affairs have been administered by the Army and by the civil agents appointed by the government. I was connected with the Indian Department myself during the years 1869 and 1870.

Q. That was when there was a transfer made to the Army?—A. That was the year in which the Army fed the Indians and their supplies were purchased by the Commissary Department, and I was one of the officers selected to issue the supplies at Whetstone Agency on the Missouri River, and immediately after the placing of these Indians upon the reservation which was selected by the Indian commission, consisting of General Harney and others.

Q. I believe you have also some knowledge of the management of the Indians by the civil authorities?—A. I have been for the last year stationed in the vicinity of one of the agencies—the Shoshones, near Camp Brown, Wyoming Territory, also in Arizona, near the San Carlos Agency at Camp Grant.

THE TRANSFER SHOULD BE MADE.

Q. From your observation of these matters, do you think it would result in an improvement to the Indians or a saving to the government, or both, if the transfer should be made?—A. I am satisfied in my mind that it would be decidedly economical to the government. That is to say, the supplies could be purchased by the Commissary Department from contractors, and delivered in much more economical way, and insuring a better division of supplies, and giving more general satisfaction to the Indians. I will say, while speaking of my connection with the Commissary Department, when issuing supplies to the Indians the supplies were issued just as we issued them to the troops of the Army. They were purchased by contract, inspected, and then shipped by the Quartermaster's Department to those agencies, where they were received by an officer of the Commissary Department, whose accounts were all made out, as they are made out by officers on duty in the Commissary Department, to the chief commissary of the United States, which is a very rigid manner of keeping accounts; and having had personal observation, I can say from my own knowledge that the manner of keeping Indian accounts is much more lax than that of the Commissary Department;

that the manner of purchase and inspection by the officer of the Commissary Department is much more rigid than that of the Indian Department.

PURCHASES AND TRANSPORTATION CHEAPER UNDER THE MILITARY.

Q. In that connection let me ask you if you think, as a general thing, the Army purchase at lower rates than the Interior Department?—A. Yes, sir; I do. I am fully satisfied of it.

Q. What is your knowledge of the transportation; is it cheaper through the Army?—A. Decidedly so, sir; I happened to be a witness in a case of the United States against a certain contractor, who had a contract for delivering supplies to the different agencies, wherein the contractor was charged with having embezzled certain stores, and know what means were taken to intercept those stores, which were shown to have been diverted from their proper channel; in other words, sent to the Black Hills for sale instead of to the agency, where they should properly have gone.

Q. Was that contractor acquitted?—A. Yes, sir; he was acquitted, I believe.

By Mr. McCREERY:

Q. Was he guilty of that act?—A. The courts said not; but I only know what the general impression was. Of course, I am not here for the purpose of maligning that contractor or putting anything on paper reflecting on his honesty.

Q. Don't state anything further than your own knowledge.—A. I only said I was a witness. If the commission desire, I can state what was shown in the court, but I do not imagine that is necessary.

Q. You can give your own knowledge as to the facts of the embezzlement.—A. I only know there was a lot of flour which was reported to belong to the Indian Department, and the sacks were produced in the court containing the brands of the flour, marked with the inspector's name and branded "U. S. Indian Department." Those sacks were taken out of the car at Sidney, and a baker stated in court that he purchased that flour from the contractor's agent who was in charge of the business. The baker testified that those were the sacks which contained the flour. That is so far as my personal knowledge of the transaction goes.

By Mr. STEWART:

Q. Did he testify that he purchased them of the contractor?—A. That he purchased them of the contractor through his agent. This agent was left in charge of the business.

Q. Do you mean the Indian agent?—A. No, sir; the contractor's agent.

Q. On what ground was he acquitted?—A. It would be difficult for me to state how he got off. We know he did get off, but when the question is put as to how he got off I am not able to state to the commission.

I alluded to this to show the difference between the transportation of supplies by the Quartermaster's Department and the present manner of transporting supplies by the Interior Department. When the quartermaster transports supplies they are turned over to an officer, who receipts or invoices for transportation, and he is held responsible for those supplies until they reach their destination and are receipted for by the responsible officer—the receiving officer; and in case of any loss occurring while *in transitu*, there is a board of officers appointed to examine into that loss and fix the responsibility. If it falls upon the contractor he

is made to pay for it; and if by any neglect or a want of proper care he fails to deliver up the supplies which he receives, he is made to pay for them.

By the CHAIRMAN:

Q. What do you understand to be the custom with the civil department in reference to that?—A. My understanding is that some one man contracts to deliver supplies to a number of agencies; that the supplies are delivered over to him and he undertakes to deliver them to these agencies over the different railroads running through the country. He may have contracts for the delivery of supplies at a dozen different agencies, as was the case with the contractor of whom I spoke, and during the investigation it was very difficult to ascertain just exactly where and to what points these supplies were going. Sometimes they would start them out to one point and then divert them and ship to another. The court found great difficulty in ascertaining just where these supplies should have gone. For instance, Lieutenant Lee testified that he had been notified that a certain quantity of stores where shipped to him which he did not receive. He finally learned that United States Commissioner of Indian Affairs had diverted the stores and shipped them somewhere else—sent them to some place where they were more needed, I suppose. The mixing up of them caused the difficulty in ascertaining just exactly how much the contractor was short on his contract. This simply shows the manner in which supplies are delivered at those agencies.

By Mr. STEWART:

Q. Before they are transported, are they not handed over to officers of the Army to take an account of and to see that they are shipped?—A. No, sir; the Army has nothing to do with it.

Q. It is certainly so in my section. Captain Hughes, of Yankton, has received the supplies there for the Indian country, I think you will find, unless I am very much mistaken.—A. That may be so in one or two cases, but I doubt if it is generally.

Mr. STEWART. I believe that is the custom. The Army officer receives the goods, and vouchers are given by him for the receipt of the goods, and he hands them over to the party who has contracted for their transportation. These goods are to be delivered at certain points. I know Captain Hughes received them at Yankton or Sioux City.

MANNER OF TRANSPORTATION.

The WITNESS. If the commission will allow me to explain, I think I can enlighten them on that point. The law requires the supplies which are to be issued to Indians to be subjected to the inspection of an Army officer. He is required to make a report as to the manner of delivery and the quality and quantity of goods, and that is about the substance of his report—the manner of delivery, the quality and quantity of the goods, stating whether they were delivered to individuals, or heads of families, or chiefs, or to the Indians as a tribe. In case of the transportation of goods to the agencies, there have been instances where the Commissary Department have inspected the supplies previous to shipment, but then they do not have anything to do with receipting for them. As in the case of the shipment of flour to the Red Cloud Agency, there was an inspector appointed to see that the flour was of the quality of the sample furnished, but he did not receipt for it. He was not responsible for any part of it. His duty was to inspect it and see that it compared

with the sample. I presume that is what you mean by Captain Hughes inspecting those supplies previous to their being shipped up the river.

Mr. STEWART. That may be true, but I know that the party who supposed he had the contract assured the government that there was no agent to certify to that fact by issuing his vouchers and assigning these goods to his care.

The WITNESS. You see, if the Army officer receipted for them, it would take them out of the hands of the Indian Department, and he would become responsible for them and would have to make a return. An officer makes a return for every article received. He gives a receipt for it and he is responsible for it until he shows a proper return to the proper department. If the commission desire, I can state the manner in which supplies are issued by the Army to the Indians.

Mr. HOOKER. I wish you would.

MANNER OF ISSUING SUPPLIES TO THE INDIANS.

The WITNESS. During my connection with the Indians at Whetstone Agency the supplies were purchased by the chief commissary of the Military Division of the Missouri, inspected by an officer under his command, and then transported by the Quartermaster's Department to the commissary who received and issued them. The agent, who was also an officer of the Army, made his requisition upon the commissary for the number of rations which he desired to issue for a certain specified time, say ten days. The rations were issued upon what is known as the ration return, similar to that used in the Army, showing the number of men and women, and the total number of rations. The supplies were turned over to the agent and he distributed them to the Indians, who held tickets showing the number in each family and the number of days for which rations were drawn, thereby insuring to each family the proper share of rations. The beef was butchered by the Commissary Department and issued out by weight to the heads of families.

By the CHAIRMAN:

Q. Distributed to the different families?—A. Yes, sir, by weight; the number of pounds for which the ticket called. The other supplies were also issued by weight. At Shoshone Agency, where I witnessed an issue and inspected the beef last spring and winter, the manner of making the issue was similar to that I have described, except the Indian agent, having the responsibility for all the supplies, alone controlled the issue. The beef was required to be inspected by an officer of the Army.

By Mr. HOOKER:

Q. But the issue to the Indians was made by the Indian agent?—A. Yes, sir.

Q. And not by an officer of the Army?—A. No, sir; all the officer of the Army was required to do was to be present and inspect the beef as to quality and quantity and see it weighed.

By the CHAIRMAN:

Q. Is that the usual way of delivery by the Indian agent?—A. No, sir; I will say this, that so far as my experience goes that is not done at every agency.

Q. I was of the opinion that beef was delivered on foot?—A. To Indians immediately around the agency it is customary, so far as my experience goes, to kill and issue; but to Indians living at a distance, camping off on some of the streams of their reservation, it is customary to deliver cattle on hoof. The manner of delivery of supplies at the Shoshone Agency

was, in my opinion, remarkably well and evenly distributed. I would like to take this opportunity of paying the agent there a compliment by saying that I think his manner of delivery was just and fair.

Q. That is at the Shoshone agency?—A. Yes, sir.

Q. Who is the agent at the Shoshone Agency?—A. I know the gentleman well, but I cannot call his name just at present.

By Mr. HOOKER:

Q. The period of time to which you refer, when the distribution of supplies was under the Army, was 1869 and 1870?—A. Yes, sir; during which time the President was charged with the care of the Indians by an act of Congress.

Q. And the distribution was made by Army officers?—A. Yes, sir.

Q. The purchases and inspections were made by the Army officers?—A. Everything was done by the Army officers.

Q. And that continued only for those two years?—A. From the 1st of July, 1869, to the 30th of June, 1870.

Q. Had you occasion to witness the distribution of supplies to the Indians during that time?—A. O, yes; frequently.

Q. Did you regard that as more economical and as a fairer method to the government or Indians than the other?—A. I do not see how anything could be fairer; it was the same manner exactly as issuing to the Army.

Q. It was done under the rigid rules of the commissariat and Quartermaster's Department of the Army?—A. Yes, sir.

PROSECUTION OF WRONGDOERS.

Q. With reference to the question of accountability, where there has been any default to follow the law, either defrauding the Government of the United States or defrauding the Indians, have you known of any instance of successful prosecution, in the civil tribunal, of defaulting agents?—A. I have never heard of one.

Q. In this case of the contractor, to which you have referred, there was a failure to fix accountability?—A. Yes, sir.

Q. The gentleman of whom you spoke was a contractor, was he not?—A. Yes, sir.

Q. In the method of holding to accountability under the Army regulations, if the bureau was transferred from the Interior to the War Department, it would be precisely the same as if there was a failure to perform a duty on the part of an Army officer?—A. Yes, sir; he would be subject to charge and trial by court-martial in accordance with the articles of war.

Q. So far as it regards the interest of the Indian himself in having a just and fair purchase made, and in having a just and fair distribution of the articles purchased, would you regard the War Department, and the agencies which it resorts to for that purpose, as more certain to secure it than the present civil system?—A. Decidedly so, sir.

MORALS OF INDIAN WOMEN.

By Mr. BOONE:

Q. It has been asserted by some that the presence of soldiers among the Indians is exceedingly detrimental to their morals; that they corrupt the Indian women, and introduce disease among them. You have been in the Indian country a good deal, and have seen the Indians managed both by Army officers and civilians. I wish you would give the commission your opinion upon this subject—whether the Indian women are

any more liable to this corruption by contact with the Army than with civilians?—A. I am free to say that, subjecting the Indians to the same contact with the same number of civilians, the difference would not be against the soldiers—that the same thing would be just as likely to occur with civilians as with troops; and, so far as my experience goes, I cannot see that I have discovered any more disease from contact with soldiers than I have from contact with civilians. It must be remembered that the Indians, as a rule, are remote from civilization; they are away out on the frontier; and that troops, as a rule, are the only white men who come directly in contact with them, unless it may be those whose reservations border upon white settlements. But such would not be the case any more with troops than with civilians.

NO MORE TROOPS NECESSARY UNDER MILITARY MANAGEMENT.

Q. Would it make the presence of troops any more necessary than it is now if the management of the Indian affairs was transferred to the War Department, and an Army officer detailed simply to act as agent in place of a civilian?—A. Not at all.

Q. So that the Indians would not be subjected to any greater contact with the troops than at present, if the transfer were made?—A. No, sir; it would not necessitate it.

Q. From your knowledge of Army officers, do you believe that they would feel enough interest in the subject of teaching agriculture and civilization to devote their energy to that end if they became agents? Do you think they would be as faithful in that regard as the same number of civilians would be?—A. Yes, sir; I think so. So far as my experience extends, it has been that an Army officer usually tries conscientiously to do that which devolves upon him, and do it well. He has an incentive to do so, and no doubt would endeavor to so conduct the affairs of his agency as to merit the approval of his superior officers. I want to say in connection with my statement in regard to the Sioux Indians, that I met Spotted Tail in 1876, some five years after I became disconnected with the agency, and he told me, through an interpreter, that the Indians had never been so well cared for, and never had received as good treatment and supplies in such quantities as they received then.

Q. That is while they were under the control of the Army?—A. Yes, sir; under the control of the Army.

I have seen it stated by some gentlemen who have been before you that the Indians had expressed themselves as dissatisfied. I will state that as a rule it is seldom Indians speak well of any one who has acted as agent before. They are not in the habit of doing that.

By the CHAIRMAN:

Q. They are rather a complaining people?—A. Yes, sir. They are like children, and find a great deal of fault; are very exacting; want everything they can get, and a great deal more.

Q. I think that holds good with all I know.—A. And also the gentleman's assertion of his knowledge of the fact that Army officers were given to drinking; I want to refute that. I want to assert that there is no more of that thing done in the Army than in civil life, and, so far as my experience goes, there is less of it. I think that is a slander on the Army, which the gentleman undertakes to state without sufficient warrant.

LINDELL HOTEL, SAINT LOUIS, MO.,
September 30, 1878—10 o'clock a. m.

DANIEL I. KELLY sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. At Saint Louis, Mo.

Q. The object of this commission is to take such testimony as will bear upon the subject of the feasibility of the transfer of the Indian Bureau from the Interior to the War Department, and as to the practicability of bringing the Indian up to a self-supporting condition. How long experience have you had among the Indians?—A. About five years.

Q. You say you have had five years' experience among the Indians; has that been as one of the employés of an agency?—A. Part of the time I was acting agent; about two years of that time I was left in charge of the agency.

Q. Were you at Standing Rock during the entire time?—A. At the Grand River Agency; the agency was removed to where Standing Rock now is.

Q. How many Indians were there at that agency?—A. At certain seasons of the year four thousand; at others as high as seven thousand.

INDIANS CAN BE MADE SELF-SUSTAINING.

Q. According to your observation could such Indians as those be made within a reasonable time, by proper management, self-sustaining?—A. Yes; I think they can.

Q. Have they any disposition by themselves to try and hold property; had they learned anything of that sort when you were there?—A. Under the rule of the Indians, they can have no independent notions of that kind; they are governed by mob law. Indian councils or soldiers make rules for the camp; they dictate; and what they say, an Indian must do. They cannot act for themselves.

Q. Do you think that is good policy?—A. That ought to be done away with, before you can do anything with the Indians.

Q. Was any visible progress made during the five years you were there towards bringing them to citizenship or towards citizenship? Was there any effort made in that direction?—A. The only effort was to induce the Indians to farm. About one hundred acres were plowed for one hundred Indians, and as soon as the crops got half ripe they picked them and ate them. They were afraid some one would get ahead of them. They cannot of themselves make any progress.

Q. Did they show any willingness to make any progress, or was it forced on them by the agents?—A. Some of them are very good workers, and some consider themselves too high-toned to work. They have too much pride. Some of them work very well when you can get them to do so.

Q. In their wilder state I have been told that they generally want the squaws to do the work, and consider it degrading for themselves to work?—A. The squaws do the larger part of the work; but an Indian has his certain work to do, and a squaw hers, the same as with whites.

Q. Who was agent at that agency while you were there?—A. Lieutenant Adair, of the Twenty-second Infantry, since deceased. He was removed by General Harney, and then a civilian agent was placed there. Major Popham was also removed in a short time, and then Mr. Johnson, who was a clerk of Mr. Greeley's, was appointed, and he was removed in a short time. Then the business was turned over to the War Department, when Major Hern, who was a retired officer, and Lieutenant

Hanlan were placed there. When they first removed there there was a good deal of excitement among the Indians. They do not like the soldiers at all. They were all housed up there, fearing the Indians would kill them. After that they became reconciled, and Major Hern remained in charge for two years. He was a good agent. Every one was satisfied with his administration. He was removed, and an agent by the name of William F. Cody, a civilian, from Washington, was appointed. He was chief clerk of the Indian Bureau. He was very honest. He was removed in a short time, and Colonel O'Conner, who was secretary of the Indian commission of 1868, was appointed, and remained there for about two years. He was also a satisfactory agent. He was a civilian.

Q. You said the troops were brought in there. Were they located near the agency?—A. Right at the agency. The camp was on the right bank and the agency on the left bank. Previous to the troops being brought there there was no trouble at all. There was no trouble among the women of the camp. Everything was exceedingly moral.

IMMORALITY OF INDIAN WOMEN.

Q. The question has been raised as to the cause of the immorality at that very agency, it being charged by the civilians it was the military. Do you know anything about that?—A. There were soldiers there at that time and civilians also. The difference between soldiers and civilians is just this: the civilians buy an Indian wife after the Indian manner, and live with her as a wife. Of course the soldiers are not permitted to do that, and have to rumage around camp.

INDIANS PREFER CIVIL MANAGEMENT.

Q. Give the committee your opinion, after your long experience, having had the Army as well as civilians there, whether you think it would be better for the Indians, or for the government, or both, to make the transfer.—A. If there was any law or force that the civilians could bring to bear, I think it would be better under civil government, because the Indians, as far as I could learn from being associated with them, do not like the soldiers. Of course they are very cunning, and to the soldiers they pretend to be very much interested in them and all that, but in reality they actually hate the soldiers. Some companies get along very well and others do not. If they could make any kind of law and enforce it, I think it would be better under a civil government. Otherwise, I should favor its transfer to the military department.

Q. What do you think in relation to extending the laws over the Indians the same as over whites, punishing them for the same crimes as we punish our own people?—A. That is just what is wanted out there. As soon as an Indian finds out that he can be independent of his tribal relations, and that if a wrong is perpetrated against him he can have redress, then something can be done with them; not until then.

Q. You think the laws ought really to be extended over them as over other citizens?—A. I do, most certainly.

Q. I suppose from what you have said you have not gone far enough to know whether they want to hold property in severalty or not?—A. I can say this, that Indians known as rich Indians have things pretty much their own way, while poor Indians are neglected, not taken into consideration, are looked upon as paupers, as among the whites. They kick them around in the camp, while rich Indians can get anything. Their principal property is horses. If an Indian has a large number of horses he is a rich Indian; if not, he is a pauper.

Q. Then they do hold their personalty, that is ponies, &c., in individ-

ual right?—A. Yes, sir; except when any of their relations die they are obliged to give their property away, lodges and everything else. These foolish laws among them retard the progress of the Indians more than anything else.

By Mr. BOONE:

Q. Where do you reside?—A. In Saint Louis.

Q. How long have you resided here?—A. Since 1850.

Q. I do not understand exactly what time you were employed at that agency?—A. From 1868 to 1873.

Q. What is your age?—A. I am twenty-eight years of age.

Q. You were about eighteen years old when you went there?—A. Yes, sir.

Q. Were you clerk while it was under management of civil authorities after the military administration?—A. Yes, sir.

Q. Were the soldiers kept there at that time?—A. No, sir, there were no soldiers there previous to the military management.

TROOPS NECESSARY AT THE AGENCIES.

Q. Were the soldiers taken away when it went into the hands of the civil authorities?—A. No, sir; they remained there.

Q. Was it necessary for them to remain?—A. After they were once placed there it was necessary.

Q. Why more necessary after being placed there than before?—A. Because the Indians seemed to change to a great extent. Friendly Indians were all the time in trouble with hostile Indians.

Q. Soldiers were kept there to preserve peace among the Indians?—A. Yes, sir; and among the whites at the same time. If they got into a fight among themselves they would kill each other and come to camp to kill white men.

Q. Do you know the occasion of bad feeling on the part of Indians toward the soldiers? Why did they dislike them?—A. I do not know that, except it was just bred right into them. When I went out there I would ride into camp on horseback, and every child would cry "white man" and they would run as though I were an elephant. They would run at the sight of white men or soldiers.

Q. They regard them as their enemies?—A. It was just bred right into them; they regard the white man as the cause of all their ills. They are bred to hate white men, but they do not hate civilians as bad as they hate soldiers.

Q. How many soldiers were stationed near that agency?—A. Two companies.

Q. How were the supplies carried to the Indians—by the military or Interior Department?—A. By the Interior Department altogether.

Q. Do you know anything about the method of transportation the Interior Department as compared with the War Department?—A. Yes, sir.

Q. Which do you think the cheaper?—A. I think the War Department is best managed.

TRANSPORTATION CHEAPER UNDER THE WAR DEPARTMENT.

Q. State to the commission whether or not the War Department has so organized its method of transportation as to make it a cheaper and surer method.—A. I think it is.

Q. There is a great deal of system to it?—A. Yes, sir.

Q. Their system of keeping accounts is very accurate?—A. Well, sir, it insures correct delivery, while the other does not.

Q. You stated that white men who go there who are not soldiers took Indian women for wives?—A. Yes, sir.

Q. And lived with them?—A. Yes, sir.

Q. And that soldiers rummaged about the camp?—A. Yes, sir.

Q. Did you mean, by rummaging about the camp, looking out for women?—A. Yes, sir.

Q. That arises from the fact that he is not allowed to take one for a wife?—A. I should judge it so.

Q. Do you think that they are any more disposed to do that than civilians would be if they were not allowed to take a wife?—A. I think any man under the same kind of feeling would do just as the soldiers do.

Q. There is a good deal of human nature in both?—A. Yes, sir. I would say that previous to the soldiers coming to that place there was not a prostitute in camp.

PERNICIOUS EFFECT OF CONTACT WITH WHITES.

Q. You give that as your opinion?—A. I give it as a fact; that is, a fact that I know of. I was thoroughly acquainted with every Indian in that camp, and spoke their language, and associated with them. I know the fact, there was no prostitutes among the Indians, as the white people term them. The soldiers had nice things, crackers, and everything like that, and women came around out of curiosity, and they were induced thereby to come into camp and look in the quarters. The soldiers gave them crackers, and induced them to come in their tents. The Indians are as much to blame as the whites for that.

Q. Have the Indian women anything like an appreciation of their virtue?—A. They are obliged to have. If any squaw does anything like that she is taken out that night by the Indians. As many as ten or twenty pass her on the prairie; that having been done they leave her on the prairie.

Q. Outside of their punishment, do they regard their virtue as worth much; do they appreciate it as women here do?—A. I think they do.

Q. Then they have some moral convictions upon that subject?—A. Yes, sir; they have. They are very modest. I have seen as high as $100 offered to one and refused.

Q. The reason I ask you this question is that you seem to think many of them demoralized.—A. I think the demoralizing effect is bad; I do not make any discrimination between soldiers and civilians—I simply say it has a demoralizing effect to have a large number of whites among Indians. The less whites the more morality, and the reverse.

Q. Who was the officer in charge of the soldiers at the time you speak of?—A. Colonel Hayman, of the Seventeenth Infantry, was in charge.

Q. What military officer do you speak of, who had charge of the agency for about two years?—A. Major Hern, on the retired list.

Q. You think his administration was satisfactory?—A. Yes, sir; there were two agents very satisfactory, Major Hern and Colonel O'Connor, both practical men, who had had Indian experience.

Q. So far as teaching Indians the habits of civilized life, including work and labor, and things of that kind, they are not inclined to take up with these things, are they?—A. No, sir.

INDIANS NOT DISPOSED TO WORK.

Q. And if they work they must be forced to it?—A. Generally so.

Q. And it requires some inducement, whether force or otherwise?—A.

There are a great many Indians who would work, if they were directed in their operations.

Q. Give your opinion as to the disposition of the different agents who were there; what was the comparison between the two agents having charge two years each, Major Hern and Colonel O'Connor, as to whether there was any difference in the disposition to encourage and assist the Indians?—A. They were both excellent gentlemen, and suited the Indians and everybody else at the agency. There was a little clash with the military once in a while.

Q. How was that occasioned?—A. By difference in opinion; the agent would think one way, and the military officer in command think another way, and would not enforce an order. There has been difficulty on account of mixed jurisdiction; the mixed jurisdiction has been the principal cause for trouble. Either one of them would be satisfactory, I think, to all parties.

By Mr. STEWART:

Q. How long were the soldiers there at that time?—A. Soldiers came there after the first year, and remained there afterward.

Q. So there was a good deal of rummaging around the camp during that time?—A. To a certain extent there was. In fact I know the soldiers rummaged around, and whenever a steamboat landed there would be a rush for the Indian camp, and rummaging for curiosities.

Q. So the rummaging around was for curiosities?—A. Yes, sir; it was.

Maj. ARTHUR W. ALLYN sworn and examined.

By the CHAIRMAN:

Question. Do you belong to the Army?—Answer. Yes, sir; I have been in the Army over seventeen years.

Q. Where are you stationed?—A. My station is at Fort Sill, in the Indian Territory, the Kiowa and Comanche reserve.

Q. How long have you been there?—A. A little over a year.

Q. Had you any experience before that with the Indians?—A. Not before that.

Q. What tribes are you close to?—A. Kiowas, Comanches, and Apaches.

Q. How far are their headquarters from your fort?—A. They are camped in different bands, anywhere from three to eighteen miles from the post.

Q. Have you any knowledge as to the number of Comanches?—A. I do not recollect. I think there are three tribes there; about three thousand Indians. Over half are Comanches. The Comanches, I think, are a little the strongest, in point of numbers, and the Apaches the weakest.

Q. You have been thrown in contact, more or less, with them in your official duties. We would like to have your opinion on the subject of the advantages and disadvantages that might result from the transfer of the management of the Indians from the Interior to the War Department. Of course, we are taking into account all questions pertaining to the Indians, and more particularly the advantages that might result to the Indians by changing the management to the War Department.—A. From my knowledge of the external management of the Indian Bureau in reference to these Indians and those situated on the Wichita Agency, thirty-two miles above the post, there seems to be at present a divided authority. The Indian Bureau, through its agents, is charged

with supplying and feeding, clothing and issuing annuities, and has general charge of the Indians. But the condition of affairs is such that the moment the Indian leaves his reserve the Army is immediately called upon to act, as it were, as a kind of police force to drive them back, hold them in check, and keep them under the authority of the Indian Bureau. From that condition of things there is a certain conflict of authority at times. In the condition of things it resembles a house divided against itself. I think, as far as the officers of the Army are concerned, they have no interest in the matter of the transfer of the Indian Bureau to the War Department. Probably they would prefer that it should not be transferred, owing to the additional duties that would devolve upon them by the circumstance. But the War Department, through the Army, has the means to do nearly all the duty done by the Indian Bureau. It has the means to enforce all the regulations that the Indian Bureau may make with reference to the troops; it has all the means to carry them supplies, and means to purchase them. It can supply the agents, and it would make a vast saving in the supplies which it disbursed. It is true there would be certain employés for certain kinds of employment that would have to be retained, supposing the bureau were transferred to the War Department, such as those charged with the schooling and religious instruction of the Indians. It would be hardly possible that the Army officers could continue with that particular branch. I cannot say that he would be unfit; but his duties would prevent. As far as the progress of the Indians is concerned, and their desire to labor, I do not believe they can be made to work without a certain amount of pressure being continually brought to bear, and by an authority able to execute its mandates.

INDIANS WILL WORK.

Q. You think they are not easily induced to work by promise of reward?—A. I know that with a restraining guard they will work very well. I have seen them at our reserve. They can and will work well; but from the condition of the farms prepared and made for them, when they had been turned over to them I could see a difference. I could see a difference in the labor at once, after a year. I saw the same sort of things in what are called the civilized tribes to the east of us. The Indians there had farms, but did not do the work upon them. When the Indian has any manual labor to perform he sublets to white men to do the work. These Indians have been in process of civilization for thirty-five years. I do not think there is any particular difference in the nature of Indians.

In the present condition of things in the Interior Department, the Commissioner requires, when an Indian agent receives kinds of goods—whether for their annuities, or flour purchased under contract, or beef—that there should be an Army officer present when these goods are received, to certify as to their quality and number of pounds; and when these are issued under instructions from the Commissioner of Indian Affairs, an Army officer is required to be present and perform similar duties. So really, at present, wherever there is a military post near a body of Indians an officer is detailed regularly to go, as it were, as a kind of detecter over the agents of the Interior Department. Whether it is necessary or not I do not know. I only know the Secretary of the Interior orders it, and the presumption is he thinks it is necessary. If it is necessary to carry on the Interior Department in that way, I think it would be decidedly advisable to turn it over to us.

ACCOUNTABILITY OF ARMY OFFICERS.

Q. We have been trying to see what can be done to better the condition of the Indians.—A. That is simply a measure for the prevention of fraud, that I was speaking of. In that matter of course an Army officer has a responsibility, and an important one, which he can be called to account for in a manner that an Indian agent cannot be under the present regulations of the Interior Department.

INDIANS GOOD HERDERS AND STOCK-RAISERS.

Q. Judging from your remarks, you hardly think much could be made of the Indians, that even if an effort were made to civilize them.—A. In one respect. The civilized Indians are taking great interest in raising cattle, and that is something that they have been encouraged in by the military authorities. When driven upon their reserve some years ago, their ponies were sold and the money taken and a large portion expended in the purchase of cattle, and they are certainly succeeding beyond our expectations in the raising of cattle. I think they make the best cattle raisers and herders in the world.

Q. I had heard that they were succeeding pretty well in the stock-business. I was going to ask you if you do not think that that may be ultimately made to apply to other tribes not so far advanced as they are, and whether it might not be held up as a pattern to others?—A. I think so. The only thing necessary upon the part of the person in charge of the Indians is to explain the advantages arising from the increase of stock, and how they would become rich, as it were, without labor. If you can explain to the Indian how to get rich without labor he will take to it. The same is true with regard to cultivating land. If you can make an Indian understand that after plowing the land you can get some one to cultivate it and give him a part of the produce, he will go into it; but as to manual labor it will require pressure to accomplish it.

Q. The Indians nearest to you, I suppose, have not really been long enough in the bounds of the civilized authorities to have made very great progress?—A. They have been on this reserve for three years; there has been no outbreak for three years.

Q. That would hardly be long enough, I take it, to test the matter whether they would be willing to work and own their own property?—A. I think it ought to be made pretty thoroughly in that time, if an effort was made. I think the Indian naturally is a very shrewd calculating man. I give him credit for possessing more sense, since my intercourse with them, than I did before.

INDIANS DESIRE TO ABANDON THEIR TRIBAL RELATIONS.

Q. Do you find any great number that are disposed to change their tribal relations?—A. There is a tendency, to a certain extent, in that direction. A few years ago, where there were only a few bands in the same tribe, now there are many, the Kiowas numbering perhaps fifteen or possibly thirty bands.

Q. What do you mean by a band?—A. These are subchiefs, some made by military authorities and some by the Indian agents. They are banded together for the purpose of receiving rations, annuities, and things of that kind. It is following up a system of endeavoring to break up the tribal relations by appointing a large number of chiefs instead of five. There are really acknowledged by the Kiowas as chiefs only five, but these others are being acknowledged and being treated as such, and in the course of time, probably a short time, they will be acknowledged as chiefs, and instead of five there will be thirty-five. I do not

think these tribal relations are as strong as represented, because I know different bands among the Comanches, for example, that have been separated for years, have very different habits, almost amounting to different tribes.

In reference to this matter of morality, I wish to say one single thing, and I do not care to say more than this, that in every tribe of Indians there are recognized prostitutes, the same as among white people. There have always been in every tribe I have ever seen. That explains the whole condition of morality. There is a recognized class of this sort among the Indians.

Q. This debauchery does not particularly apply to either soldiers or civilians?—A. No, sir; I don't think there is any such great emount of debauchery as is spoken of. I do not see very many half-breed children.

INTERMARRYING WITH WHITES.

Q. Are the whites permitted to come in and marry and become citizens with the Indians at the agency near you?—A. In the civilized tribes they become citizens upon marriage. In some of the other tribes they permit white men to marry and live among them. I do not know of an instance where a poor white man has risen to any prominence among them, or been what you might call a citizen among them.

Q. Some of the eastern tribes encourage it?—A. The object of the white man's becoming an Indian is to get a portion of the land, the land being held in common. A man who marries and becomes an Indian is entitled to the same rights to locate his lands where he pleases.

Q. The same inducements are not held out there?—A. No, sir.

By Mr. BOONE:

Q. You intimated a while ago, and I will get you to state again, whether or not you think Army officers generally desire this transfer?—A. I think they do not, sir.

Q. If they should be placed in charge of the Indian agencies do you think they would be disposed to assist the Indians?—A. I do, sir; I have talked the matter over for some years past among my fellow-officers. We believe if they are placed in our hands it would be an end of Indian wars. We would rather be patient on the reserve for ten years than to have one winter campaign, for a campaign against the Indians in the winter is ten times harder than a campaign was during the late war.

CAUSES OF INDIAN WARS.

Q. State whether you think a great many of our conflicts with the Indians are produced by mismanagement of their affairs.—A. I can speak of this outbreak of Cheyennes at Fort Reno. The outbreak there had been expected by the officers. A portion of my regiment was at Fort Reno; they were brought back a little over a year ago to their reserve at Fort Reno, and complaints were made to General McKendee, who was commanding at Fort Sill, and extended to Fort Reno. He was the officer who brought them down from the north. Their complaint was that they were not receiving the proper amount of food which they were entitled to under the treaty made at the north. An officer was sent to investigate the complaints, and I saw his report, and I found the agreements of the government were not being carried out; and, in addition to that, last winter upon their hunting expedition they were unsuccessful, and for that reason they needed supplies more than ever. It is not surprising, under the circumstances, that they left. I do not think very many of the other Indians on the reserve left with them.

Q. Are not the facilities of the War Department much greater and their means much surer than the system pursued by the Interior Department for transportation?—A. Yes, sir; for we transport large quantities of supplies at regular stated periods.

Q. Have you had occasion to institute a comparison of the supplies issued to the Army and to the Indians?—A. I have seen them both frequently. Those that are now issued to the Indians are good, for an Army officer inspects them on the ground. Those being received this fiscal year are very good.

Q. The Army inspector would not pass them if he did not believe they were conforming to the Army regulations?—A. No, sir.

Q. And the supplies issued to the agencies are good because an Army officer does the inspecting for the Interior Department?—A. Yes, sir.

Q. And you say where an Army officer is convenient that this method is usually resorted to?—A. It is always resorted to; at least it is in the Department of the Missouri, at the request of the Secretary of the Interior, that an officer should be present and make a report. I make my reports through military channels, and before flour is paid for at Washington we have to make out a certificate certifying that that flour has been received.

THE LAWS SHOULD BE EXTENDED OVER THE INDIANS.

Q. We have broached the subject to some extent, and it may become a question as to the propriety of extending legal jurisdiction over these Indians, putting them under the same sort of laws as govern the whites?—A. I think it would be a very good thing eventually. I think they have about as much idea about law at present as they have about God, and that is nothing. Since I have been away I heard of an instance—I don't know whether correct or not; I presume it is, however—of some Indians we had at the post who were to be arrested and taken to Fort Smith for trial, for an assault made on soldiers, and they drew their knives and prepared to resist and kill themselves, and were killed by the marshal or officer in charge. The same thing occurred some years ago when we were taking prisoners down to Texas; one of them killed himself before starting. They have an idea that whenever they are removed from their reservation for the purpose of trial it is death. It would take a long time to get them over that feeling.

THE CIVILIZED INDIANS SHOULD NOT BE TRANSFERRED.

By Mr. STEWART:

Q. Have you had any experience among the so-called civilized tribes?—A. Nothing, except traveling through their country some little.

Q. Suppose the Indians at a certain agency had adopted the modes and customs of white men, &c., and were devoting themselves to agriculture and were very strongly opposed to the transfer of the Indian Bureau to the War Department, on the ground that they regard it as derogatory to their interests; would you be in favor of making the transfer? Would you think it desirable?—A. I should inquire as to the means that had been employed to get this expression of opinion from these Indians, to see whether it is their opinion really, or whether it is the opinion of other parties who are interested in their affairs. There is a peculiar condition of affairs in reference to the civilized tribes. There has been a pressure upon Congress to open up those lands, and some of he Indians are opposed to it, and some not. There is a great deal of eeling. It is some of the best land in the world, and white people are ready to move into that country at any time. Go to the Indians and

say that the transfer of the Indian Bureau to the War Department would open up that territory to settlement by the whites, and you could get all the signatures on petitions that you desire.

Q. Suppose these Indians were intelligent enough to draw the distinction, and to understand that there was no trouble in that respect, and that their reserve was their own until they desired to remove from it?—A. I should think it would be bad policy to transfer that agency to the War Department if that feeling were an honest one. I doubt the existence of it very much.

Q. In my own State, for instance, we have the White Earth Indian Agency. They have their schools and churches, and are perfectly satisfied with their present management, and are horror-stricken at the idea of the transfer of the bureau, not because they are afraid of the Army, but because they are aspiring to citizenship, and they feel just as you or I would if we were to be put under surveillance. That is their objection. I would like to ask you whether you would think it proper and just to transfer such an agency as that to any other department when they were perfectly satisfied with their present management?—A. I should think they were in that condition that the problem was settled, and that they should belong to no department. I should consider that the Indian problem was settled.

By Mr. BOONE:

Q. That the Indians ought to govern themselves under such circumstances?—A. Yes, sir; I think they ought to be good citizens.

By Mr. STEWART:

Q. But if the transfer is made those Indians must go, and no exception in their case?—A. I think there ought to be an exception. You have brought them up as high as governmental agency is capable of bringing them.

Q. The outlook, then, for these parties and their only hope of improvement, as you think, is to make citizens of them?—A. Yes, sir.

Q. And that is what they are aspiring to?—A. They should have it if they have risen to the point you represent. They should be put upon their own resources.

SAINT LOUIS, MO.,
October 1, 1878—10 *o'clock a. m.*

JOSEPH LA BARGE sworn and examined.

By the CHAIRMAN:

Question. The main object of this commission is to gather such testimony as will throw some light upon the feasibility of the transfer of the Indian Bureau from the Interior to the War Department. The propriety of this change has been suggested, and we are trying to ascertain whether or not it would be a matter of economy to the government or advantage to the Indians to do so. You can give us your opinion, based upon your experience of Indian affairs. Where do you live?—Answer. Saint Louis, Missouri.

Q. Have you lived here any length of time?—A. I have been living here all my life.

Q. What experience have you had with Indians?—A. For many years I have been trading and doing transportation on the Upper Missouri. For the last forty-eight years I have been engaged in that.

Q. You run trading boats, I believe?—A. Yes, sir. The last few years I have been engaged in governmental transportation.

Q. You have had some experience as to the cost of transportation for the Indians, and probably for the military?—A. Yes, sir; I have done both.

THE TRANSFER SHOULD BE MADE.

Q. We would like to have you state to this committee, based upon facts that have come to you, your opinion as to whether it would be better and cheaper to make the transfer to the War Department?—A. Undoubtedly the Indians would be benefited by the change from the civil to the military department.

Q. The Indians would be benefited?—A. Yes, sir; there is no doubt about it.

Q. Do you mean morally or financially?—A. I mean financially only. At those agencies, in the hands of the military—for instance, like Cheyenne Agency, or Crow Creek Agency, or one or two others which have been in the hands of the military for the last two years. I asked the Indians what change they observed, and asked them if they got more rations. They say they get more than they can consume; much more than during the civil administration; therefore I say the Indians would be benefited by the change. The Indians don't like the military at all; they don't like to be under control of them. The great trouble has been to get the right kind of men.

Q. You base your opinion upon the fact that fair play has not been had by the Indians? That they have not really received what they are entitled to?—A. Yes, sir; they have not.

Q. Is there any good reason why it may not be as well done by the civil as by the military, if the same rules are enforced?—A. I don't see why it could not be done as well by the civil as by the military. I think it could be better done by the civil; the Indians would like it better—it would suit them better.

Q. You have not been confined, have you, in your statement, to the two tribes you have referred to—these Crows Creeks are a portion of the Sioux?—A. Yes, sir; a band of the Sioux. My greatest experience is with the Sioux tribe; I have been with them more than any other tribe in my life. They covered the whole country up there in that direction.

Q. Have you any better system to offer than the present one for the management of the Indians?—A. I don't know anything better, if carried out properly, than the present system, with agents who are the right kind of men, and men that will be just to the Indians. Let the Indian get what he is entitled to and he will behave himself. He wants to live at peace with the white men; that is the feeling among the Indians; I know that very well, and I have been acquainted with them many years.

Q. Of course you have had but little opportunity to observe whether there has been any effort made to better their condition morally, so far as bringing them up to a self-sustaining condition?—A. There has been some effort, but very little, in that direction. They gave it to be understood that there was to be an effort of this kind; but I have seen but little of it.

THE INDIANS FEAR THE MILITARY.

By Mr. BOONE:

Q. What seems to be the feeling of the Indians toward the military generally?—A. They fear the military, and they have a right to fear

them. From my observation they have been rather roughly handled by the military; I think they have a right to feel so.

Q. I suppose you speak of the military acting under the orders of the department?—A. I mean the military in that country—the young officers, for instance, that may be sent out to visit some band or tribe, and that is where they get that treatment which I don't think is right. They fear them on that account.

Q. But still you say they are much better pleased with the rations they receive from the hands of the military?—A. Yes, sir.

Q. Have you had occasion to inspect the supplies that have been issued under both managements?—A. I have transported some of them.

THE WAR DEPARTMENT FURNISHES THE BEST SUPPLIES.

Q. Give the commission your opinion as to the character of them, whether or not the supplies furnished by the military department have been better than those furnished by the civil department?—A. There is no comparison. The military furnish the best, and the Interior Department furnish the worst.

Q. Has there not been among the Sioux Indians great complaint as to the quality and quantity of the supplies furnished by the Interior Department?—A. Great complaints. They have come to me and asked me to make complaint to the Father at Washington. Indeed, once or twice, during President Lincoln's administration I wrote to him about it. As you are aware, we have had mixed jurisdictions. The management of the Indians is with the Interior Department and at the same time soldiers are stationed among them.

Q. What is your opinion as to the propriety of that mixed jurisdiction? Does it not produce a conflict of authority, and does it not fail to operate well?—A. I don't think it ought to produce a conflict, and it should not fail to operate well.

Q. The question is, does it not produce a conflict of anthority?—A. You need the military to use as a power to keep these Indians in subjection. Whenever they manifest a disposition to break away, you must have a little power to use.

THE PRESENCE OF THE MILITARY NECESSARY.

Q. The presence of the military is necessary, you think, to some extent?—A. There has been more of it there, however, than there was any necessity for.

Q. Do you think that the presence of the military generally has been detrimental to the prosperity of the Indians?—A. No, sir; I don't think so. You may say it has been when they are in too close contact. The soldiers introduced vices among the Indians that they didn't like to have among them—the Sioux Indians especially.

Q. Is that confined especially to the military?—A. No; there is a lot of men around the agencies that ought to be the first that are driven away.

Q. I understand you to state the great cause of complaint or disturbance is the white men who go out there to make money?—A. That is where it springs from.

Q. Any system that can be adopted to prevent that, would, of course, be beneficial to the Indians?—A. Yes, sir.

Q. As well as to the government?—A. Yes, sir; it would be beneficial to both if these men could be sent from the country.

DISPOSITION OF AGENTS TO INSTRUCT IN AGRICULTURE.

Q. As far as Indian agents are concerned, have you found a very great disposition on the part of many of them to take hold and encourage the Indians in agriculture and civilization?—A. Very few of them.

Q. Do you know of any reason why an officer of the Army, if he should be detailed as agent, would not take just as much care and interest in the prosperity of the Indians and in their advancement as a civilian agent?—A. I don't see why he could not and why he should not.

Q. If the Indian Bureau were transferred to the War Department, so that an officer could be detailed to take charge of these Indians, would there not be a great saving to the government?—A. A great saving to the government—a clear saving to the government.

Q. Would it require the presence of any more soldiers there with a military officer for an agent than with a civilian agent?—A. No, sir. The Indian character is a peculiar one; he wants all he is led to believe he is entitled to, and he wants no deception about it. They are very peculiar in that way. There would be less liability of their being deceived in the hands of the military than in the hands of civilians. I look at it in that way. The military officer has got a life commission, and if he is not disposed to be honest his commission will force him to be honest.

Q. You are familiar, of course, with the manner of transportation as carried on by the War Department, and also by the Interior Department. State to the commission, if you please, whether or not the War Department has a well-regulated system of transportation?—A. Yes, sir; they have.

Q. Is it better than that of the Interior Department?—A. Yes, sir; much better.

Q. The facilities of the military system for detecting fraud and wrongs are very good?—A. Yes, sir; under the system of the military department no fraud can be committed without being detected; under the other you can do it very easily.

By Mr. STEWART:

Q. Your experience has been principally confined to the Sioux Indians?—A. Yes, sir.

Q. Have you had any experience among the partially civilized tribes?—A. No, sir; there is a band of Indians we came in contact with—the Mandans.

INDIANS CAN BE MADE SELF-SUSTAINING.

Q. Are they situated so that they could be trained to agricultural pursuits if the agent should desire to instruct them?—A. They could be placed in a position where they could follow it up and do well. I think they could sustain themselves after being instructed a year or two. There is a fine agricultural country in that section, lying along the streams. It is a country for stock and grain. I am satisfied that with proper management these Indians could be made self-sustaining in a few years.

Q. Is it not a fact that civilians could be selected who are better adapted to instruct in agricultural pursuits than men who have made a profession of arms?—A. Yes, sir; I am satisfied of that. If you want to instruct in agriculture you must have a practical man as instructor

Q. Stock-raising and agriculture is, of course, their first step toward citizenship?—A. Yes, sir; that is the first step—stock-raising and agriculture. There has not been enough tilling of the soil, and too much schooling.

By the CHAIRMAN:

Q. What do you think as to instructing the Indians in the arts and sciences, as we would term them, and agriculture, &c.? Do you think that that can be done, and that finally they may be made self-sustaining?—A. I think so, sir, from my observation there. The Indians themselves, ten or fifteen years ago, when they had an abundance of game, would state to you that they would not do it; but they have changed their minds. Game is scarce, and they are almost starving, and they have come to the conclusion that if they could be placed on a reservation where they could raise stock and till the soil they would be glad to do it. They have changed their minds a great deal in the last few years. Necessity is the father of it.

Q. Your experience has been with what we call the "semi-barbarous" tribes?—A. Yes, sir.

Q. And certainly the commission would be glad to hear from you on that account. We have received considerable testimony from those who have made some advancement in civilization, and we desire to ascertain if these Indians can be made self-sustaining by proper management.—A. I am of the opinion that the thing can be accomplished in a few years by proper treatment.

By Mr. BOONE:

Q. At an agency there is a man employed as a farmer, is there not?—A. Yes, sir.

Q. And a blacksmith?—A. Yes, sir.

Q. Whose particular business it is to oversee that department?—A. Yes, sir.

Q. And the agent, except as to general supervision, has nothing to do with it. It being necessary to have a professional farmer and a professional mechanic in the different departments, any man, as an agent, who would earnestly and scrupulously attend to his business, would be acceptable, no difference what his profession?—A. Yes, sir; he would be very apt to be acceptable.

By Mr. STEWART:

Q. Would it not be better to have a practical man as agent to oversee the farming. Is the farmer really not under the jurisdiction of the agent?—A. The most important qualification for an agent is that he should be honest. He ought to be an honest, upright man, and he should be a man that would take an interest in the Indians.

By Mr. MCCREERY:

Q. Under the present system there has been a great deal of dishonesty?—A. Yes, sir; a great deal, and it is increasing.

By Mr. STEWART:

Q. Do you not think that a system of transportation of supplies could be adopted by the Interior Department which would be as efficient as that of the War Department?—A. Yes, sir; there could be, I should think, but the way it is done now is not very good.

ECONOMY OF THE TRANSFER.

Q. How would you save expenses if an officer fills the place of agent?—A. There would be the expense of the salary of the Indian agent, that would be saved in the first place. Then the great expense attending these agencies could all be done at the military posts, and would that not be saved?

Q. There are a vast number of agencies where they have no military post, and where the compensation of the Army officers would amount to more than the agents' pay; how is it about those?—A. An officer has got to draw his pay anyhow.

Q. Have you officers sufficient to leave their commands to be detailed for this service?—A. I think there are officers enough now in the Army there are hundreds there that I know have very little to do and have had very little to do.

Q. Would you take men so inefficient that they were not capable of taking a command and put them over the Indians?—A. I do not suppose a man could get a commission from the government unless he was efficient to attend to the duties of an agent.

INDIAN AGENTS SHOULD BE PRACTICAL MEN.

Q. Don't you think it requires a peculiar training?—A. A man appointed as an agent ought to have some acquaintance with the Indians. That, of course, would be all the better, but an upright and honest man, who would go there disposed to do justice to the Indians, would soon get in their way and learn a good geal.

Q. Still, it would be better, would it not, to put a good, honest Indian man over them in the first place than to have a man learn after he got there?—A. I think so, sir.

By Mr. McCREERY:

Q. Do you think that the mismanagement, dishonesty, and fraud practiced in transactions with the Indians through those agents have had anything to do in bringing about the recent wars we have had with the Indians?—A. I think it has had all to do with it.

SENECA CITY, MO.,
October 7, 1878.

Chief JOSEPH, chief of the Nez Percés, examined through an interpreter:

The CHAIRMAN. We would be glad to hear from Chief Joseph on the subject of the contemplated transfer of the Indian Bureau from the Interior to the War Department. If he has formed an opinion let him express it, and state anything else he wishes to.

Chief JOSEPH. I am very glad to express myself to you chiefs. I am very glad to express myself to you chiefs and I want to. To-day you will find out what I think. I will disclose it to you, but I want time to think. This is my heart I am about to express; I am honest in what I am about to say. From experience, my people see and discern as they go around—men and everything else. I am better able to speak now than heretofore. I can express myself in a better way. I am going to give my conclusions from what I have seen in this country. I think very little of this country. It is like a poor man; it amounts to nothing. I see that it is not very productive; that it is not a productive country; I see this with my own eyes. This country has hardly anything to produce fine stock; it is not a grazing country.

INDIANS DESIRE TO GO TO WORK.

By the CHAIRMAN:

Question. Would you like to go to stock raising and grazing if you were

in a country suitable for those purposes?—Answer. Yes, I would. If I had the power to go and select a country where I know it would produce, I would be glad to farm and raise stock.

Q. What do you think as to turning the management of the Indian Bureau over to the War Department? Which do you think would take the best care of the Indians, the military or the civil department?—A. When I was small I understood that there were two departments in our government dealing with the Indians—soldiers and civilians. I have watched the dealings with the Indians very closely.

By Mr. McCREERY:

Q. Which, in your opinion, deals most fairly with the Indians?—A. I understand them thoroughly.

Q. That is not an answer to my question.—A. I understand them both. They stand about in the same position in regard to the government—have about the same authority; the military and the Interior Department. Yet I think both of them could be set aside.

Q. What would you supply in their stead?—A. We should have one law to govern us all and we should all live together.

INDIANS WANT TO BE FREE.

By Mr. STEWART:

Q. One law for the Indians and all citizens of the United States?—A. All should be citizens of the United States, to come and go when they please, and be governed all alike. Among the people I see they have all one mind when you let them have their own way. Liberty is good and great, when a person can come and go when he pleases. Any person can better support himself when he has the liberty to go and come when he pleases. If you see a place where you can be better off by going there and raising stock, better go there. It is much better for one. It is not good to keep us as you keep prisoners, in a corral, and keep us on one spot of ground. It is hard to make us live in that way. Those are my ideas.

By the CHAIRMAN:

Q. You know you are here in consequence of the war you had with our people. Will you tell us what you think caused that war?—A. The man who had authority over us; the man who was looking after our welfare.

Q. Whose fault was it?—A. I was just going to tell you. They had drawn a line around a certain portion of our country and were about compelling us to go on there and live, and it was like driving us in a corral; there was no place to get out; they were about to compel us to live on that spot of ground. It was like corralling wild animals. They were prepared to put us on the reserve like wild animals—put us there to live and die, and if we were to live, it was for us to look out for ourselves. Everything was dear to us in our own country; our horses, cattle, land, and streams of water were dear to us.

Q. Where is that?—A. Over in our own country. The authorities told us that winter that we were to go upon the reserve, and they would allow us two horses apiece, and all the stock left off the reserve would be the white man's property.

MORTALITY AMONG THE NEZ PERCÉS.

Q. How many of your tribe came to this place?—A. I cannot tell exactly without counting them.

Q. Have your people been very sickly since coming here?—A. Since

our arrival on the Missouri River we have lost 70—since our arrival at Fort Leavenworth.

Q. How many came?

The INTERPRETER. Something over 418. I believe 8 were added to the party after arriving here from Montana. I believe 21 died at Fort Leavenworth, and 45 or 46 died at this place.

CAUSE OF THE NEZ PERCÉS WAR.

By Mr. MCCREERY:

Q. Have you anything additional to say as to the causes of the war?—A. I would like to explain it all to you. Where we had our quarters the white men tried to take it away, and did take it away from us. And orders were given, that if we all did not obey the order and go upon the reservation, to follow us up after a certain number of days and attack us if we were not upon the reserve. I said to the man in authority—General Howard—not to be too hasty. I said to General Howard, "Don't be too hasty; let us talk this matter over and have a thorough understanding." I said, "I don't want to have any trouble, nor do I wish to get my people in trouble; let us talk this matter over thoroughly and have a thorough understanding." General Howard told me, "I will give you thirty days to get on the reserve; don't let one day go by, or I will have the soldiers after you." The soldiers then came on each flank while we were moving toward the reserve.

I would like to say something else. My friends, men of authority, I am glad to see you. I have expressed myself, and I would like to hear from you—how you feel in regard to these matters. This is my feeling now.

By the CHAIRMAN:

Q. We are all friends of the Indians. We came here to ascertain what was best for the Indians and what they needed and desired.—A. The country is as large as the people inhabiting it; that country was made for us all; it was made for all the people to live upon. I don't think it was made for one portion of the people to contribute to the other or pay rent; it was not intended that any people should have authority to set aside another part of the people and tell them that they shall live so and so, and take their liberty from them, and do so and so. I do not think that is right. Land was made like the sun—the sun to give equal light to all, and land was made to give as equal living, so long as men worked for it. Land is like the sun, equal for all. I do not think it is right for one set of people to domineer over another set and tell them that they shall do so and so. If we could all do that way, I think after this when we meet we will get along much better. Everything was made to grow from the earth to support ourselves on. The water was made to run for us all to drink of alike; we are all given the same liberties to do so. I do not think it was intended that one people should be kept and held and bound as prisoners by another portion of the people. The way is as big as the land.

BOGUS CHARLEY, chief of the Modocs, sworn and examined.

By the CHAIRMAN:

Question. We want to know the feeling of your people; how many there are of you; how long you have been here; how you like it, and what change you desire to make, if any, in your manner of living; and

whether or not your people wish to settle here and attend to farming. First, how many are there of your people?

The WITNESS. One hundred and three, all told.

Q. How long have you been here?—A. I think about five years.

Q. How many came with you?—A. Somewhere in the neighborhood of 150; about that.

MORTALITY AMONG THE MODOCS.

Q. What are you doing—farming?—A. Yes; we try farming. When we came here they put this man here as agent. We listen to what he say about it. He told us to go to work. We want to do what is right. What I tell you is true. About three years we do that work; try farm. We do what is right. We want to learn. I got children. I want to do what is right. I want to be benefited; to do work and live just like white people. But there is another thing, my friends, I want to say to you. We die; we lose a good many in this country; this land don't suit them. My heart; I tell you what I feel now. We die out; my people. We don't like that. I wonder what makes me talk. We want health. Our people lose a good deal. That is what make me talk.

Q. Do you desire a change?—A. Yes, sir; we lose too many. Everybody feel like they want to get home. That is what we want and feel now; because a good many die. Everything hard to keep here. We try to learn this way. We want to live just like white man. We love to live; don't want to die.

INDIANS OBJECT TO MILITARY.

Q. Have your people any choice as to who manages the Indian Department? Do they prefer that the Indians should be managed by the Interior Department, or would they prefer to have the War Department take charge?—A. We want to be white men; good citizens. We don't want soldiers, you know; but we want the citizen. I want him to be good man—about the same as this [pointing to their agent]. We die; good many. That is what makes me talk. I tell you best I can; we get English very hard.

Q. Did you speak English before you came here?—A. Yes. I speak English some. I came here and talk little; not much.

Q. Are all your people here, or are some of them back in the country where you came from?—A. Yes. I got much people there. I have had sisters and brothers and part brothers there. Most of my people back there. I got more people back there than I have here.

By Mr. MCCREERY:

Q. Where are the others?—A. At the agency in the southwestern part of Oregon. We work hard; we got no blacksmith; that is what make me talk. We got no blacksmith; we got no place to fix it. We work hard to get money; we got no blacksmith; nothing of that kind. We have good houses, and everything of that kind, and good blacksmiths we like here then. We got nothing of that kind. Whatever dollar we make we lose it. That is what make me say. We got land; if we had school-houses close by and blacksmiths, everything there, that we would all like. We want good health. We don't want to stay here, because we have not health, or any blacksmith, or anything of that sort. That is all.

JOHN JACKSON, chief of the Shawnees, examined by an interpreter.

By the CHAIRMAN:

Question. How long have your people lived here?—Answer. I was born and raised here myself, but I do not know how long my people have been here.

Q. How many are there of your people?—A. I don't remember; about 70 or 80, I believe.

Q. They are gradually dying off—becoming less and less in numbers every year?—A. Some years when we number our people together we find that they are decreasing a little, and sometimes that they are increasing. They have been about stationary for several years.

SHAWNEES PREFER TO BE MANAGED BY INTERIOR DEPARTMENT.

Q. Are you satisfied with the present management of the Indians, and if not, what changes do you desire; or have you something new to suggest?—A. I should prefer that the Interior Department manage Indian affairs.

Q. Will you please state your reasons for this preference? Do you think, if the Army had authority over you, they would have full power to make war and punish you?—A. I don't look at it in that way. The Indian would be shoved off without any protection. I prefer that the Interior Department continue its management, because it has had control so long, and I don't know that it would be any better if under the military authorities.

Q. Then you are satisfied with the present management and have no suggestions to offer in the way of a change?—A. I do not see where it would benefit me or my people by changing it. I would prefer to have it remain where it has been.

Q. Your people are engaged in farming, are they not?—A. Oh, yes.

Q. And stock-raising?—A. Yes, sir.

THOMAS PECKHAM, chief of the Peorias, sworn and examined.

By the CHAIRMAN:

Question. You have been a citizen here for a long time, have you not?—Answer. For about 9 years.

Q. What number have you of your people?—A. About 200 or more.

Q. Have you increased or decreased since you have been here?—A. We have decreased.

Q. How much?—A. A good deal; I do not remember how much.

Q. Has this proven to be an unhealthy country for your people?—A. It is an unhealthy country for strangers to come into.

Q. Are the Indians satisfied with the present management of Indian affairs?—A. Yes, sir.

PEORIAS SATISFIED WITH PRESENT MANAGEMENT.

Q. We are trying to ascertain whether it would not be better to turn the management of the Indian Bureau from the Interior Department over to the War Department. Do you understand that question?—A. Yes, sir.

Q. Give us your opinion on that point, if you please.—A. We are satisfied with the management we have. We are improving all the time in the way of civilization, schools, and farming.

Q. And your children are being educated?—A. Yes, sir; we have good schools.

Q. You are engaged also in farming and stock-raising?—A. Yes, sir; we raise stock and farm altogether.

Q. Are your children inclined to take to our habits of dress and language?—A. Yes, sir.
Q. Like to learn our language?—A. Yes, sir.
Q. Are your schools properly cared for and looked after?—A. Yes, sir.
Q. And kept up?—A. Yes, sir.

By Mr. McCREERY:

Q. How far from here do you live?—A. About 9 or 10 miles.
Q. Is it a good farming country where you are?—A. First rate.

By Mr. HOOKER:

Q. You have just expressed your opinion about the transfer of the Indian Bureau from the Interior to the War Department. Do you understand that if transferred to the War Department you would still be governed by the laws, treaties, and regulations between the government and the tribes, just as at present?—A. Yes, sir; I would rather be under the Interior Department.

Q. Still, if an Army officer was appointed as an agent, you would be under the laws, treaties, and stipulations existing between the government and the Indians?—A. Oh, yes; I understand that.

The CHAIRMAN. If you have any suggestions, you can offer them. As you say you are satisfied, we did not have much to say to you. There are others who are dissatisfied. We want to know what will satisfy them.

JOHN SARRAHASS, ex-chief of the Wyandotts, examined through an interpreter.

By the CHAIRMAN:

Question. How many are there of your tribe, as near as you can tell?—Answer. The last I knew anything about the number of the Wyandotts, I think there were about 260 of them—those that are here and in the Indian Territory.

Q. Are they increasing or decreasing at present? How many came here in the first place? They have been here for several years I believe.—A. I do not know that I can answer definitely in reference to the number when we came here, from this fact, that they came here by small parties. It was only a few years ago that a certain class of Wyandotts who have become citizens were adopted; therefore I cannot tell the number when we came here. We came in small bands and parties.

Q. Some white men have gone into the tribe. How many?—A. About ten white men have intermarried with our people.

WYANDOTTS SATISFIED WITH PRESENT MANAGEMENT.

Q. Are you satisfied with the present management of Indian affairs by the Interior Department?—A. In reference to that I have this to say: As far back as after I became a man and became interested in the public affairs of the Wyandotts, I began to inquire into the management of the Government of the United States toward the Indians. This question of being turned over to the War Department was talked of long ago—a number of years ago—and consequently I think I am pretty well versed in these affairs. The way things have been managed by the Interior Department, I am perfectly well satisfied with. Under its management we have all apparently done well and prospered, and I think it is a good policy to let well to do alone.

H. H. GREGG sworn and examined.

The CHAIRMAN. We are taking such testimony as we can gather throughout the country in regard to the Indians—more particularly relating to the subject of the transfer of the Indian Bureau from the civil to the military department. With this statement of our object we would be pleased to hear from you.

By the CHAIRMAN:

Question. You have been here a good many years?—Answer. Yes, sir.

Q. Are you acquainted with all these tribes?—A. Yes, sir.

INDIANS PREFER PRESENT MANAGEMENT.

Q. Will you state to the commission what you know about their condition, and whether or not they are satisfied with the present management, and what they desire?—A. As you have heard, all the Indians say that upon the question whether they will remain where they are, under the Interior Department, or go under the War Department, their preference would be to remain where they are, and the Indians know more about it than I do. I am willing to join with them and say that perhaps the administration of Indian affairs would be better in the civil hands; but from my knowledge of the conduct of affairs in this immediate section, I do know that there is the gravest necessity for improvement in the service.

Q. You are aware, I take it, that by the contemplated change to the War Department it is not proposed to give them any more power than at present—such power as rests at present with the civil department?—A. Yes, sir; I am aware of that.

Q. With that understanding we would be glad to have your reasons for continuing it where it is.—A. I would just say this, that I have observed the conduct of affairs in this Quapaw Agency for the past six or seven years, and I know of a great many things very loose if not absolutely wrong. My plea is for an improvement of the service and a correction of the wrongs in it. So far as I know of the conduct of Indian affairs it is almost impossible, as the system now exists, to eradicate these wrongs that have grown up.

IRREGULARITIES AT QUAPAW AGENCY.

With reference to the incumbent of this agency, I have known upon three occasions of grave charges being preferred against him; I have sat by and seen them proven; I have known these to go to the Commissioner of Indian Affairs and Secretary of the Interior, and I know that that gentleman remains in office.

MORTALITY AMONG THE NEZ PERCÉS.

By Mr. MCCREERY:

Q. Who is he?—A. H. W. Jones. If it is possible to get at some means of ferreting out wrong-doers and punishing and putting them out of place, this Indian service needs it. There is a little item with reference to the Nez Percé Indians that you gentlemen ought to know upon the score of humanity. These people have been here less than two months. In that time forty-seven have died. From my own knowledge they have died from neglect. They have been in their camps as much as ten days at a time without medicine. They were brought here without any provisions; their lodge-poles were left at Baxter Springs, and they were

without shelter. In consequence of this neglect and want of medicine forty-seven of them have died since coming here.

Q. Have these matters been made known to the Interior Department?—A. Yes, sir; upon a previous occasion, at an investigation, I heard this proven, that Jones, as agent, had supplied his private table with government stores. I remember of a gentleman's testifying that he had stood by in the agency store when he knew Indians were being charged two and three prices for goods. An Indian going to Seneca to buy flour for $2.50 a hundred was made to pay four dollars for it. Shoes $1.50, to an Indian he sold the same pair of shoes for $2. In buying a ten-cent piece of tobacco, the Indian was charged 25 cents for it. This agent knew of these things. Here was the store and he must have known of them. Upon another investigation I heard this fact established, that he had awarded a meat contract for six cents when bids were before him for four and a half and five cents from responsible parties. These was no question of responsibility. There was one and one-half cents a pound lost to the government. I heard of a number of instances where building permits for building were awarded without public letting. All these mission schools were built in that private manner. I heard a man testify that he heard a contractor say the agent tickles them and they tickle the agent. I heard men testify that they have sold goods under permission of the agent where the agent taxed them ten per cent. on gross sales of goods. This testimony is on file to prove these facts. If you will take the trouble you will find the testimony on file in the department. And yet this agent is retained after these things were shown.

By Mr. STEWART:

Q. How long has it been since attention was called to these facts?—A. In 1874. There was a commissioner here during the past summer.

Q. Who was it?—A. A. R. Lewis, of Saint Louis, specially detailed. He is a clerk in the department, I think.

By Mr. MCCREERY:

Q. How many tribes has Mr. Jones charge of?—A. Quawpaws, Peorias, Miamis, Ottawas, Modocs, Shawnees, Nez Percés, Wyandotts, and Senecas.

By Mr. STEWART:

Q. What is the number in all?—A. I should judge the average number to be not more than 1,500.

Q. I mean the entire number?—A. That is the aggregate number—from 1,500 to 1,700. I know appeals have been made to the Commissioner in reference to these matters time and again, and I know they amount to nothing. I hope your commission will take upon yourselves to look into the matter and see if there are no means of correction. I have certified copies of vouchers from the Interior Department. In one of these vouchers there is a charge for 191 bushels of corn at 65 cents, corn sold by George D. Morrow. He will testify he never sold the government an ear of corn. I have a voucher showing the sale of an old horse, made by Agent Jones, for the use of certain Indians, and the charge made for the horse is $80. Men in this section, who knew the horse, will testify he was not worth one-third, possibly one-half of the money. I have a voucher showing the transfer of an old wagon that was admitted by Jones to have been in his service twelve years, which he brought from Indiana, and the government is charged $75 for that wagon. I have also a voucher for two new wagons which the government bought for $85; a difference of $10 between a new and an old wagon.

Q. The old wagon had become well seasoned during the 12 years it had been used. Who was the commissioner here in 1874?—A. Colonel Kimball, I think.

Q. Have such representations been made to Commissioner Hayt?—A. Yes, sir; by myself and by other parties. Smith was the Commissioner when the first complaint was made.

By Mr. BOONE:

Q. Was it E. P. or John Q. Smith?

The CHAIRMAN. I take it it was John Q. Smith.

MINISTERS SHOULD NOT HAVE CHARGE OF THE BUSINESS OF AN AGENCY.

The WITNESS. If you will allow me to make a statement or suggestion, and take it for what it is worth: While these Christian denominations in the charge of the education and moral condition of the people do well, I think it is a great mistake to place the business part of this Indian system in their hands. While they are Sunday-school teachers, they are not business men, and it seems to me these men are sent out here because of their church connection, and without business qualification. You want men of business integrity and experience to do the business of our agencies. Let the churches take charge of the Indians and teach them in religion and letters, but from my observation these Christians as agents are not the most desirable.

By the CHAIRMAN:

Q. This is a part of the Quaker branch?—A. Yes, sir; it is in the Quaker department. You will find Catholics here, and good Catholics, too, among the Indians.

Q. I suppose there has been no objection by those people to others coming in and introducing their opinions of religion?—A. As I understand it, it has been a close corporation allotted entirely to Quakers. Quakers are excellent people as a class, because I lived among them in Pennsylvania, and I know; but bad Quakers are just as bad as other people. It is allotted to them for the spread of their peculiar ideas.

Q. And others are excluded from this place?—A. I suppose any minister could come among the Indians, but he would have no say-so in the education of the young or the management of the schools. I suppose a man of any Christian denomination would be permitted to talk to them; but the schools are preserved exclusively to the Quakers.

By Mr. HOOKER:

Q. In connection with the question as to the policy of the government looking to the welfare of the Indians, and of changing the Indian Bureau from the Interior to the War Department, I understand you to say that you rather concur with the opinion expressed by the various chiefs whose testimony we have taken this morning, that it would be better under the Interior Department. Does this gentleman you speak of, and whose conduct you have referred to, still have charge of the agency?—A. Yes, sir; as the agent of these various tribes.

INDIANS SURE TO SECURE JUSTICE UNDER THE MILITARY.

Q. If you find that these faults, these difficulties, and these frauds are perpetrated under the civil administration of the Interior Department, what is your opinion if an officer of the Army, either retired or in active service, should be assigned to duty as agent? He could be called to accountability through the surer system of military court-martial. Don't

you think the government would be more likely to have a fair administration under such an officer?—A. I certainly do on the score of honesty and honorable dealing think the department would be far better with the Army; but because the Indians like this civil system, I would defer to their wishes in the matter if you can make it honest.

Q. Does not this view or notion entertained by these tribes upon this question rest upon the false idea that a transfer to the Army means government by muskets and force rather than by the civil process?—A. I think it does; yes, sir. I think they are encouraged in their views a very great deal by those who get their bread and butter through the present system, and I think they are responsible for a good deal of the opposition exercised by the Indians toward the Army.

Q. If they had a good understanding with an Army officer when assigned to the agency of any particular tribe, and knew they would be governed by the laws of the United States and the treaties between the United States and the Indians, they would then have no particular objection to this transfer?—A. I think not, sir. They fear they will be subjected to that austere discipline that they know is among Army people.

NEZ PERCÉS COMPLAIN OF SUPPLIES.

Q. Do you think the administration by an Army officer would be more likely to secure to the Indians what they are entitled to?—A. No doubt about it. The allowance per capita of rations to the Indian is 1½ pounds of beef, and I know that these Indians are not getting one-half of their rations; I know that the Nez Percés have been fed upon the most wretched flour—musty, terrible stuff. I do not think such things could occur in the Army, because officers would not admit such flour. Upon the question of these supplies for the Nez Percés I very much prefer that you would interrogate the interpreter. He will tell you that these Indians have been drawing their rations and complaining time and again for redress, and that they are receiving but three-fourths of a pound of beef when they are entitled to one and one-half pounds.

GEORGE D. MORROW sworn and examined.

By the CHAIRMAN:

Question. You live in this part of the country, do you not, Mr. Morrow?—Answer. Yes, sir.

Q. How long have you lived here?—A. In this town nearly four years. I have been living in the neighborhood quite a number of years.

Q. Is there any other person by your name in this section?—A. I have a brother living at Neosho.

Q. None by your full name?—A. No, sir; my brother is circuit clerk of the county.

Q. Please state to the commission what you know about these transactions referred to by the last witness, and whether or not they refer to you.—A. In regard to the corn?

IRREGULARITIES AT THE QUAPAW AGENCY.

Q. Yes, sir.—A. I suppose it applied to me. All I have to say is that I never furnished Mr. Jones or the government a bushel of corn in my life, that I know of. I know that I never furnished Mr. Jones any corn. In regard to Mr. Jones, I had some business with him, and I had to sign a voucher for moving the Modocs, and for a plowing and hay contract. At the time I signed the voucher he said there were some other articles he wanted to put on the voucher, and he asked me if I would sign it,

and I signed the voucher. Afterward I saw there were 191 bushels of corn furnished, at 65 cents per bushel.

Q. You furnished the hay?—A. Yes, sir; I furnished the hay.

Q. But never furnished the corn?—A. No, sir; not a bushel.

Q. Does the agent know about these statements?—A. I do not know that he does, although I have made a statement to two commissioners before this.

Q. What do you know about any wagon being turned over to the government?—A. All I know about it is that my understanding was that he turned in a wagon; and his son told me that they brought the wagon from Indiana, and that they had run the wagon for twelve years. At the time the wagon was turned in I believe it could have been paid for with $35; that would be my judgment. What the wagon was turned in for I do not know.

Q. Did you see the new wagons, for which $85 were charged?—A. Yes, sir.

Q. You did not know what quality they were?—A. The first lot of wagons paid for were the "Mitchell" wagons—the best wagons we have in this country.

Q. The price charged for these wagons was not out of the way, was it?—A. I think they were the "Mitchell" wagon.

Q. What do you know about the delivery of any horses?—A. The horse that Colonel Gregg speaks of it would be very high to give $40 for. He was an old, broken-down horse—very old.

EXORBITANT PRICES PAID FOR BEEF.

Q. State about the beef contract.—A. In regard to that: I was living about half a mile from the agency, on the farm, and had a large amount of stock near there. John R. Dickson, who is the largest cattle-dealer in this section, wanted me to see Jones and furnish the contract. He proposed to furnish me the beef and wait until the government paid me and then I could pay him for the beef. I went to see Jones. My first bid was that I would take the contract at 5 cents. He never gave me any answer. Some time after that Dickson came down and asked me to figure on it, and told me he would furnish me the cattle, and for me to make the bid at 4½ cents, and I could make the hide and tallow, which would pay me for pasturing and butchering. I made the bid at that price. He asked me what I made out of it. I told him, but he never made any reply to me. Mr. Murdock got the contract at 6 cents a pound. Dickson is one of the largest cattle-dealers in the country, and a man of means, and could give as good a bond as any man in the country. The colonel can tell you whether I could give a good bond or not.

By Mr. McCREERY:

Q. Was anything said to you about the tickling operation?—A. No, sir; nothing at all. Mr. Dickson said to me one day, at my house, I think, "If you grease Mr. Jones, you can get the contract"; but I was taking the contract so low that I could not grease him.

By Mr. BOONE:

Q. You had not a dollar to spare?—A. No, sir; the contract was so low that I had not a dollar to spare.

H. W. JONES, agent at Quapaw Indian Agency, affirmed and examined.

By the CHAIRMAN:

Question. How long have you been here?—Answer. Seven years.

Q. Have you been agent during all that time?—A. Yes, sir.

Q. How many tribes are there here?—A. Nine.

Q. We have been taking testimony on the subject of the management of the Indians, whether it would be advisable to transfer their management to the War Department, or permit it to remain where it is under the civil branch of the government.—A. I have had no experience whatever with the War Department, and I cannot therefore say what they would do.

Q. What progress have you made here in the way of improving your Indians in the way of farming and bettering their condition generally; have you got them trained up to work any better than when they came here?—A. Yes, sir; a great deal.

Q. What kind of work?—A. Farming and general agricultural labor.

Q. Do any of them make enough to support themselves?—A. A great many of them make a living and even more, having something to sell, and are constantly increasing in property.

INDIANS SATISFIED WITH PRESENT MANAGEMENT.

Q. So far as you know are they generally satisfied with the present management of affairs?—A. Generally satisfied; yes, sir. There may be exceptions.

Q. There have been some charges made here this morning against you, which, perhaps, you would like to reply to?—A. I do not know what the nature of those charges is.

Q. In the first place it was charged that exorbitant prices had been charged for articles that were furnished to the Indians—a wagon for instance, and a horse; another charge was that a certain amount of corn had been charged for as coming from a gentleman who denied having sold you any corn. Those are the main charges.—A. Everything has been purchased at just as low prices as the articles could be bought for. In regard to the corn for which the gentleman signed the voucher, it was purchased of different parties. The corn was actually furnished, and the money paid for it. It was at the time the Modocs came here; there were no funds available for their support from November up to the next July, and I had to buy just wherever I could buy, and I bought corn and paid money for it. Mr. Morrow did some plowing and furnished some hay, and that was fully explained to him, and he signed the voucher for the corn, and I drew a check in his favor, and he indorsed it to me and I got my money back which I paid for the corn.

Q. He understood the matter at the time?

GEORGE D. MORROW. I told you in regard to the settlement. Jones asked me to sign a voucher. The voucher was for breaking up for the Modocs and for hay. Major told me at the time that there were some other articles he wanted to include in the same voucher. I did not know what was in the voucher—whether or not the corn was in at the time. I do not remember.

The WITNESS. The corn was for the mission school instead of the Modocs.

By the CHAIRMAN:

Q. What was your object in having him give a voucher to cover what you had purchased from other parties?—A. Well, sir; it was a year when corn was very scarce and there were but few places it could be got and we had to pay cash. I had no funds available for it.

Q. Have you any papers of any kind which will show from whom you did buy it?—A. Yes, sir.

Q. Are the parties here?—A. No; not all of them.

Q. What reply have you to make to the price of the wagon? It was stated here that you had charged as much for a wagon which you had run for twelve years as was given for a new wagon in good order.—A. There was no wagon bought or paid for at more than its cash value.

Q. A horse was also alluded to as having been sold, as some testify, at a price much higher than the real value of the animal. What kind of a horse was it you sold?—A. I never sold any horse to the gentleman who made the statement.

Q. There was a horse mentioned in a voucher?—A. Yes, sir; I bought the horse.

Q. It was a horse you bought for the use of the agency?—A. Yes, sir.

Q. Was the horse worth all you paid for it?—A. Yes, sir; every dollar, and more, too. He was a cheap horse at the price I paid for him.

Q. You paid the amount for him which is charged in the voucher, did you?—A. Yes, sir; precisely. No more nor no less.

Q. There was a statement also made before our commission this morning in relation to the purchase of beef—that you contracted for beef at a higher price than the same quality of beef was offered to you. How was that?—A. I contracted for beef at a higher price than some beef was offered to me, not of the same quality. That came about in this way: When the Modocs were brought here we had to have beef for their subsistence. I had several parties make propositions, and two parties made propositions who had shipped all their salable cattle and left a lot of cows on hand—many of them with calf—and they offered to furnish them while a certain number lasted, and that would throw me out of beef at the spring of the year when beef was higher. I contracted with a man to pay him a half a cent more a pound, I think it was, and had beef furnished the whole season.

Q. The statement before the commission was that you paid six cents a pound for the beef. Was that right?—A. I am not sure. I am inclined to think that that was about what I paid, but I cannot tell.

Q. And that beef had been offered at 4½ cents per pound?—A. That was just the circumstance under which the beef was purchased.

Q. They would not furnish the whole amount?—A. No, sir; not the whole amount; and would give me cows that were with calf. It was beef cattle we wanted.

H. H. GREGG. That statement is exploded by the fact that that very herd of cattle was put in under that contract, and the testimony is on file at Washington which proves it. These identical cattle were furnished Mr. Jones which he says he would not receive. They were the identical cattle put in under the six-cent contract.

The WITNESS. These matters have been investigated two or three times. Colonel Kimball went through them very thoroughly.

By Mr. BOONE:

Q. Were the 191 bushels of corn, to which you refer, in the voucher which Mr. Morrow signed?—A. That is my recollection.

Q. Did I understand you to say that you did not buy the corn from him?—A. That is what I stated.

Q. You bought it from other parties?—A. Yes, sir.

Q. And put it in his voucher?—A. Yes, sir.

Q. What other parties did you buy from, do you remember?—A. From Mr. Coleman and from my son; he had corn at that time.

Q. Was that your method of doing business, buying from one person and charging it to another?—A. No, sir; not when it could be avoided.

Q. Could you not just as well have taken the voucher from the party from whom you purchased the corn?—A. I could have taken vouchers, but I could not pay for it—could not draw the money from the government funds until they were placed to my credit. That is a practice that the superintendent followed very often. I have known him to buy bills of groceries at different houses, and embrace them all in one bill and in one voucher to obviate the accumulation of papers.

Q. Did you tell Mr. Morrow, at the time of making the voucher, that it included these 191 bushels of corn which you had purchased from other parties?—A. Yes, sir.

GEORGE D. MORROW. I do not remember it so; but I remember the major telling me there were other things he wanted to get the money on.

By Mr. MCCREERY:

Q. So you thought you could draw the money on a false voucher and, at the same time, could not draw it on a true voucher?—A. I did not regard that as a false voucher.

Q. Was it not, when it was written down that you bought 191 bushels of corn from Mr. Morrow?—A. I had bought the corn and paid the money for it.

Q. Was it not a falsehood when you said you bought 191 bushels of corn from him when you did not?—A. I did not regard it as such.

Q. You regarded it as true?—A. I regarded that I had furnished the corn——

Q. Did you regard it as true or false that you bought 191 bushels of corn from Mr. Morrow?—A. That never entered into my mind; I regarded it as a legitimate, fair, and strictly honest transaction, as the government received the full value for every dollar and every cent.

By Mr. HOOKER:

Q. I observe in this voucher which was handed to the commission by Mr. Gregg when he gave his evidence this morning the following receipt: "Received at Quapaw Agency, Indian Territory, 22d day, 9th month, 1874, from H. W. Jones, $172.15, in full for the above account." That is signed "George D. Morrow." Did you really pay that amount to Mr. Morrow, as indicated by that receipt?—A. I drew the check and gave it to Mr. Morrow, and he indorsed it and gave it to me. A part of it was due to Mr. Morrow and a part of it was due to me for money I had advanced and paid out for the corn.

Q. And you took a receipt from Mr. Morrow for the entire amount?—Yes, sir.

Q. I find below the following certificate: "I certify on honor that the above account is correct and just, and that I have actually, this 22 day, 9th month, 1874, paid the amount thereof." Signed "H. W. Jones." That is your signature, is it not?—A. Yes, sir.

Q. I also find this following notice: "All vouchers must show a sufficient explanation of the objects and necessity of the expenditure; the dates, rates, and places at which services were rendered must in all cases be stated." Did this voucher do so; did it comply with those regulations?—A. Yes, sir; I think so.

Q. You actually paid the amount specified to Mr. Morrow and took his receipt for it?—A. Yes, sir; that is his receipt.

Q. Did you actually pay that amount to him?—A. Yes, sir.

Q. In point of fact, you never bought any corn from him at all?—A. No, sir.

Q. How was it you took his receipt for corn purchased from other parties?—A. Because other parties, some of them, were away, and I

could not buy their corn without paying cash, and I paid them cash for it. I bought it of my son principally, and I could not buy corn of him and take a voucher from him.

Q. You bought from you son?—A. Yes, sir.

Q. You did not, then, in fact, get any corn from Mr. Morrow?—A. No, sir; that is my recollection.

Q. When you bought corn, you say you were obliged to buy it for cash?—A. Yes, sir.

Q. Why did you not take a voucher from the person from whom you bought?—A. I could not get my money back if I did.

Q. Why; would not a receipt from the gentlemen from whom you bought the corn be just as good as a receipt from Mr. Morrow?—A. I bought 91 bushels of that corn from my son. He afterwards paid a dollar a bushel for corn to supply its place. Corn went up.

Q. From whom did you buy corn besides your son?—A. I bought 91 bushels from my son and the other 100 bushels from Mr. Coleman.

Q. Do you regard this certificate, which was made by you on one of the government blanks, as stating the facts upon its face as they actually occurred?—A. I did, at the time, regard it as stating substantially the facts.

Q. In fact you did not buy any corn from Mr. Morrow?—A. No, sir.

Q. But you did buy corn from other parties, and got Mr. Morrow to execute a receipt for it?—A. Yes, sir.

By Mr. McCREERY:

Q. What year were these purchases made?—A. 1874.

Q. How much corn did you buy that year altogether?—A. I bought 191 bushels.

Q. That is all the corn you bought for the twelve months?—A. Yes, sir; I think that is all the corn I bought for the government that year.

By Mr. HOOKER:

Q. Why could you not have bought corn from your son?—A. It is contrary to the regulations of the department.

Q. What regulations?—A. Of the department.

Q. What regulations do you refer to?—A. He at that time was an employé.

Q. Of whom?—A. Of the government.

Mr. CRAIG. Let me explain this voucher. This is a voucher in which his son transferred property, horses, wagons, &c.

By Mr. HOOKER:

Q. I see this: "One horse for use of the mission, $80; one wagon for the use of the Modocs, $75"; making $155. "The above property was purchased at open market, under competition, at lowest available rates. H. W. Jones, Indian agent." Signed or receipted by Mr Endsley Jones.—A. That is all correct.

Q. Was your son an employé under the department in 1875 as well as 1874?—A. I do not recollect.

ENDSLEY JONES (son of the agent). At that time of the year I was not.

By Mr. HOOKER:

Q. Thirtieth day of the first month. Was your son at that time an employé of the government?—A. I think not; no, sir.

Mr. CRAIG. You will notice it is the year 1874 that this transaction occurred; December 28, 1874. The sale must have been made at the time he was an employé.

ENDSLEY JONES affirmed and examined.

By the CHAIRMAN:

Question. You have been engaged at this agency with your father?—Answer. Yes, sir.

Q. How long have you been here?—A. I have been about here nearly seven years.

Q. Have you been in the employ of the government all that time?—A. No, sir.

Q. How long and when were you in the employ of the government?—A. I was in the employ of the government in 1874, the latter part of 1875, I think a portion of 1876, and in 1877.

Q. You have heard the evidence of these witnesses on the subject of these transactions. Will you please tell us what you know about them?—A. I was special agent in charge of the Modocs for one year, and the balance of the time I was acting as clerk.

Q. Did you make vouchers while in the employ of the government here to be filed with the returns of the agent?—A. I do not understand the question.

Q. Did you execute receipts for your services while in the employ of the government?—A. Yes, sir.

Q. Are they in the returns made by the agent?—A. Yes, sir.

Q. You will please state whether or not any of these transactions spoken of occurred while you were acting in the capacity of an employé of the government. This contract about the beef, for instance?—A. Yes, sir; I know about that.

Q. What do you know? Have you any correction to make of the statements by the other gentlemen who testified?—A. The statements were correct, as I understand, except my understanding was that the bid was five cents.

Q. And they paid six cents?—A. And they paid six cents for the reason stated, that the amount of cattle was not sufficient, and the quality was not considered good.

Q. You are pretty select about the kind of cattle used for the beef?—A. Yes, sir; we have been. They generally receive good beef.

Q. What do you know about that wagon transaction?—A. The wagon was well worth the money.

Q. How long had it been used?—A. The wagon had not been used so long as stated. It had I suppose been used some eight or ten years; I cannot tell exactly. It had been used very little; it had not been injured any.

Q. We come next to the transaction in reference to the corn. That corn seems to have been sold in the year 1874. That year you were in the employ of the government?—A. Yes, sir.

Q. Had you the privilege or right of raising corn, &c., and charging for it while you were receiving pay from the government?—A. That corn was raised in 1872, when I was not in the employment of the government. It was corn raised by my neighbor and myself.

Q. It had been on hand two years?—A. Yes, sir. Corn had become very scarce in the country and could not be bought except for cash. The agent hadn't a dollar of government money on hand, for the reason that no appropriation was available for running the schools or supporting the Modocs.

Q. The year that corn was raised you were not in the employment of the government?—A. No, sir; I was not.

Q. State to the commission whether or not you considered the trans-

action which you had with the agent while you were in the employment of the government as a fair and honorable one. Did you consider that a fair way of dealing?—A. It was absolutely necessary for us to have corn. There was no money to buy it. He had exhausted the money on hand in buying supplies. It was absolutely necessary to have corn. He proposed that I should let him take the corn and use it for the government, and that I should be paid the amount that it would cost to replace it. That was the only way he could get the corn. Corn was worth a dollar a bushel at that very place.

Mr. CRAIG (to the witness). Do you state that corn was worth a dollar a bushel at the time of the transaction?

The WITNESS. I do not know exactly at that time.

Mr. CRAIG. I will bring Mr. Morrow to prove that he sold corn for 50 cents a bushel.

By the CHAIRMAN:

Q. You were aware of the manner in which your father was transacting this matter and making the voucher?—A. Yes, sir. I did not think that there was anything wrong about it, from the fact that it was absolutely necessary that the corn should be furnished. It was a question which could not be gotten over. The corn had to be had; he had no means with which to obtain it; he could not buy the corn in the country on time. I advanced the corn and made nothing by it whatever. The government did not lose a dollar or cent by the transaction.

By Mr. HOOKER:

Q. If this corn was raised at a period when you were not an employé of the government, and it became necessary for the support of the Modocs to sell it to the agent, your father, why could you not have given a receipt for it, as well as Mr. Morrow, the gentleman who did?—A. I do not know but what I could have done so. I suppose I might have given it.

Q. You might have done it?—A. I do not know but what I might. It was not used for the Modocs.

Q. It don't make any difference what it was used for. The question is, could you not have given a receipt for it? You say you raised it in 1872, and that at that time you were not in the employ of the government?—A. I say I do not know. I cannot answer the question.

By Mr. STEWART:

Q. Does the regulation as to vouchers, which has been referred to, apply to the time when the article was sold or when it was raised?—A. I understand it applies to the time when it was sold; it does not apply to the time when it was raised. That regulation was not in force until after that arrangement was made, I think; that is, until after the corn was bought I did not know of any such regulation. That is my understanding about it.

By the CHAIRMAN:

Q. What year did you come here?—A. February, 1872.

Q. You say you were not in the employment of the government in 1872?—A. No, sir.

Q. Were you farming at that time?—A. Yes, sir; I did farming.

Q. And you raised this corn in 1872 and kept it for two years before selling it?—A. Yes, sir; I raised it in the fall of 1872, and then in 1874 I used the corn.

By Mr. HOOKER:

Q. At the time you executed that government receipt you were not in the employment of the government?—A. No, sir.

By Mr. BOONE:

Q. You say the reason why this beef, which was offered at 5 cents a pound, was not accepted, was that it was inferior beef?—A. That is why, as I understood it.

Q. Is it not a fact that that same beef was furnished and used under the six-cent contract?—A. Not to my knowledge.

Q. Have you any knowledge upon the subject?—A. No personal knowledge upon the subject; no, sir.

Q. Who made that offer of five cents?—A. I think it was Mr. Morrow.

Q. The gentleman who testified this morning?—A. Yes, sir.

Q. Did J. R. Dickson make an offer to take the contract and furnish the beef?—A. Dickson and Morrow were together, I think. I was not acquainted with Mr. Dickson at the time. I think they were together when the talk was out. They were talked of as being together. I think Dickson, perhaps, was to furnish the cattle and Morrow was to butcher; something of that sort.

Q. Who did furnish the beef?—A. J. C. Murdock.

Q. Where did he get the cattle?—A. Bought them all over the country.

Q. Do you know whether or not he got them from Dickson?—A. I do not know.

Q. Nor from Morrow?—A. I do not think he got them from Morrow. I did not know of Morrow having any cattle to sell.

Mr. CRAIG. If you will put yourselves to the trouble of looking up the testimony on file in the Interior Department—the report of Maj. A. R. Smith—you will see that Dickson (and I will say that Mr. Dickson is one of the largest cattle herders in this section of the country, and has many on hand) testified that he furnished to Mr. Murdock the very cattle he would have slaughtered had he got the contract at 4½ cents, and that Mr. Murdock put in to the government at 6 cents cattle which they would not take from him at 4½. If any one of you will look at the testimony on file in the department you will find that stated. I have here a voucher for two wagons sold for $85. They were perfectly new and complete in every respect. This wagon that Jones admits to have been in his ownership and employ for from eight to ten years, and which Mr. Morrow states he stated to him had been running twelve years, he puts in at $75, and calls it purchasing in open market, and that that was the real value of the property.

Mr. H. W. JONES. It was necessary to have very heavy wagons for these Modocs. They were careless in the use of wagons, as they had never used them, and it was necessary to have heavy wagons. Those wagons were 3-inch wagons and this was 3½ inch. Those were factory-made and this was hand-made at the shop. The wagons were very different.

Mr. CRAIG. You ought to have the Modocs testify how far it run. I have heard them testify that it has been an expense to them ever since they had it.

Mr. H. W. JONES. That might be so with reference to any wagon. I want to be put on record as saying that by none of these transactions was there one dollar illegitimately made, or one dollar more expended than would have been expended in any other place.

METROPOLITAN HOTEL,
Omaha, Nebr., October 12, 1878.

Assistant Adjutant-General ROBERT WILLIAMS sworn and examined.

The CHAIRMAN. This Commission was appointed more particularly to inquire into the propriety of turning the Indian Bureau over to the War Department. That is the main question we have before us. We have gone out of the way somewhat and have taken other evidence in relation to the management of the Indians. We would like to have your general opinion, based upon your experience, as to whether you think it would be better to have the management of the Indians under the War Department, and if so why; or if you have any new method to suggest, we would like to hear it.

THE TRANSFER SHOULD BE MADE.

The WITNESS. I am decidedly of the opinion that it would be for the interests of the country and of the Indians that the transfer should be made to the War Department. My reasons for thinking so are, that in my judgment the condition of the Indians to-day, as regards their barbarities and desire for bloodshed, is worse than it has ever been. They recognize the wisdom of being at peace occasionally, and generally these periods of peace are used by them principally in preparing for war. . Whoever may be to blame for this, it is evident to my mind that there should be some change; and I cannot but hold the Indian Bureau, as at present conducted, responsible for it. To repeat, I believe that some change is necessary, and, owing to the unsettled condition of the country in which the Indians roam, I see no other means than to change the administration of the Indian Bureau to the War Department. I do not believe it is possible, as a rule, that a gentleman raised in the East, having no practical knowledge of the Indians, or of the Indian character, knowing nothing about the methods of conducting business on the Western plains—I say I do not believe it possible that a gentleman of that sort can either understand the Indian character, during the time that he would be likely to hold an appointment as Indian agent, or that he could so conduct the affairs of the agency as that the supplies to be issued to the Indians by the government can be regularly and judiciously distributed to them. Neither do I believe that a gentleman raised in a peaceable, civilized country, where the civil law has full force, and knowing nothing of the violent scenes of bloodshed enacted on the plains—I do not believe that such a man can bring under proper control a lot of these savages, without some other and more effectual means than mere moral suasion; and I do not believe that even if he had the force at his command he would have also the experience and skill necessary to use it to the best effect. For this reason I am of the opinion that an officer of the Army, whose education and lifetime experience and discipline ought to familiarize him with the Indians and their habits and methods of warfare—who knows how to handle troops, and how to apply them in the case of Indian outbreaks—I believe that he would be able to, and would control the Indians better than the first-named gentleman possibly could. I do not, so far as my experience has gone, think that the question of honesty or dishonesty, whether on the part of the agent or of any one else, should enter into this business, because that is a question for judicial punishment—for civil punishment. I think that there is a plenty of good men, both in the Army and outside of it, who could attend to and manage the affairs of the Indians without any trouble; but as a general principle I think that the Army should have the control of the matter—

mainly because they have the experience of dealing with the Indians, understand their character, and have the force at hand to make the wishes and purposes of the government respected and carried out.

LAWS SHOULD BE EXTENDED OVER THE INDIANS.

Q. What is your opinion of the propriety of extending the laws over the Indians the same as over the whites—punishing them for the same offenses and in the same way, &c.; have you thought on that subject?—A. I think that that would be a good thing.

Q. At present I believe they have but little law; nothing that will serve on their reservations; nothing that will take hold of and punish them for offenses, except that I believe the government takes notice of murder and things of that sort; beyond that, I believe they have nothing in the way of law of any kind among most of the tribes.—A. In the present condition of the Indians, it seems to me that while they may not govern themselves by our ideas, yet there are few Indians nowadays who do not know that we regard murder as crime punishable by death. I think also that in punishing for murder, where an Indian knows that it is a crime punishable by death, hanging for murder has as much of an effect in the prevention of the crime as it does in civilized communities. I have known of several instances of that kind, where the effect of the example was most salutary.

Q. Would you be in favor of the War Department having the power to punish for crimes and misdemeanors, as well as to have the function of distributer of the annuities and supplies? The civil authorities go no further than to distribute the annuities and supplies, and to take charge of the peaceable part of the work—the work of teaching them, as they profess to do in some cases, and in others I presume they do not do so much of it. Would you be in favor of giving more power to the Army than to the civil authorities?—A. I would be in favor of some legal process, rather than of the arbitrary will of any one individual. There are minor offenses which an Indian may commit, and which a commanding officer should treat just as he would treat the same offense in the case of one of his own soldiers; but in cases of importance, I should be decidedly of the opinion that there ought to be some means by which punishment could be inflicted, rather than to leave it to the mere arbitrary will of any one officer.

By Mr. McCREERY:

Q. What is your opinion of the means of transportation by the Army, and the means resorted to by the Interior Department—which do you regard as the cheaper and more effective?—A. I cannot say as to that. I only know this, however, that we never have any difficulty under the most adverse circumstances in supplying our troops with the necessary articles issued to them. We have contracts with citizens for these supplies just as the Indian Bureau has, and if the contractor fails in carrying out his contract to the letter—if he delays a day in delivery of the stores beyond the time allowed and stipulated—we make him pay for it.

INTERIOR DEPARTMENT FAILS TO FURNISH SUPPLIES.

Q. Has the Interior Department sometimes failed to furnish supplies, and been compelled to look to others for them?—A. It has been the case with the Army supplies that happened to be in the hands of troops in the vicinity of Indian agencies. My understanding is that the cases have not been infrequent where Army supplies have been issued to the

Indians for the purpose of keeping them from starving, or for the purpose of preventing an outbreak on their part; that is my understanding.

Q. Do you know anything special in regard to the management or mismanagement of any of these Indian agents?—A. I do not, sir; of my own knowledge I know of nothing.

By Mr. STEWART:

Q. In regard to the transfer, would you make the same rule apply to the civilized or semi-civilized Indians as to the wild ones?—A. I see no reason for any difference. So far as my judgment goes, the semi-civilized Indians need a restraining hand equally with other Indians, though it may not be necessary to have it bear down as hardly as in the case of the wild and barbarous ones; and in the same way they need such restraints in dealing with the bad characters among every tribe just as in the case of all civilized communities. I cannot see how an Indian agent, with civil employés, in charge of a semi-civilized tribe, can control them unless he has some police force for that purpose that would be prompt and efficient in its operation; and I think that the Army would furnish by far the best facilities for such a work, far better than the Indians themselves could furnish. I judge from what I have heard and from what I have known of in the Indian Territory. The Indians themselves cannot protect themselves from the lawless whites around them.

Q. That is applicable to the Indian Territory, you think?—A. To the Indian Territory and to all this Western country.

Q. I am speaking now more particularly of the Indians of my own State—the Chippewas—who have always been at peace, and who feel very strongly against this transfer, and who are civilized and characterized to a great extent, and who cultivate their farms and are peaceable and quiet?—A. I know nothing of the Chippewas, but my understanding would be that with the Chippewas it would be very much the same as with the Six Nations of New York, that they could be governed very much in the same way. As I speak at present, however, I have reference to the Indians west of the Mississippi River.

Q. That is the reason for my asking the question, because I infer from your statement that you were applying your remarks to the Indians west of the Mississippi River only. I will ask you another question. Is there any reason, in your judgment, why the Interior Department should not have as good a system of transportation as the Army?—A. I know of no reason why it should not.

By Mr. BOONE:

Q. It seems to be the policy of the government to encourage as far as possible the pursuit of agriculture among the Indians, and to elevate them, both as to the habits of civilized life and as to their moral condition. There is an apprehension upon the part of some, as I have heard it expressed, and which, perhaps, you have also heard expressed, that the Army officers would not have the patience to try to develop in the Indians those qualities which are necessary to make them self-sustaining and industrious, and advance them in moral character. You have had a long experience with the Army and with Army officers, and I would be pleased to have your opinion upon that subject?—A. My experience would lead me to say this: I cannot see why any profession in life, whether one or another, should have the effect of enabling those trained under it to do away with the necessity of the exercise of patience; or why belonging to any particular profession should have a tendency to develop patience more than another, as I understand you to apply it to the case in hand. My experience is that men are the same with

slight individual variation, and I cannot see that one set of men should claim that they alone have the patience or the ability necessary to accomplish certain moral ends—certain industrial effects—any more than another set of men. On the contrary, as to the amount of patience required to be exercised in dealing with the Indians, my experience has taught me that that kind of requirement is no more lacking in the Army than with any other men who have come in contact with the Indians in the matter of governing and training them. My idea as to the making of the Indians self-supporting is this:

INDIANS MUST BE CONTROLLED BY FORCE.

In the first place, the whole tradition and education of the Indian is calculated to teach him that the greater the warrior he is, the more influence he has among his people. His whole life is gauged to that standard. Every thing he does, every act, every exploit, amounts to a certain number of counts or points making up his reputation. For example, if an Indian warrior kills a man, it counts for him a certain number of *coups*, as we might call it, in his history. If in killing a man he touches him with his "coup-stick," or takes his rifle away from him and kills him with that, it counts a still greater number of *coups* for him. If he kills a child, or a woman and a child, it counts another number of *coups*. All these acts of daring, or bravery, or barbarity, as the case may be, and in fact all the various acts of his life, go to make up the sum total of his reputation, an accurate account being kept of all these marks, and the greater the number of these *coups*, the greater the reputation and the influence of the man upon his people. That is, in my judgment, the reason why, or at least it illustrates why, it is that each Indian strives to be a great warrior; for without the reputation thus gained he amounts to nothing at all with his tribe and people. Under such an education and with such traditions I do not believe that a peace policy alone, or a government entirely made up of moral suasion, will have the effect permanently to control the Indian. I think he needs something else, something more effective, and that something in the shape of force rightly applied.

SOLDIERS NECESSARY AT THE AGENCIES.

Q. We have rather a mixed jurisdiction at present, as you are aware. We are obliged to keep soldiers in the neighborhood of some of the agencies now, and sometimes these soldiers have a conflict of jurisdiction with these agents. Now, if the transfer of Indian affairs should be made to the War Department, and the Secretary of War should designate certain officers to take charge of the agencies, would there be any greater necessity for additional troops among the Indians than as at present?—A. I do not believe that any Indian agency ought to be without some troops.

Q. But I speak of the necessity; would the mere fact of the agent being an Army officer make it necessary that there should be additional troops?—A. Eventually, I think that there would be a probability that so many troops would not be required as at present.

By Mr. HOOKER:

Q. You were speaking of the necessity being as great among the five semi-civilized tribes who occupy the greater portion of the Indian Territory as with the savage tribes?—A. No, not so great.

Q. You think it would not be so great?—A. I hardly think that it would be.

Q. You are aware of the fact that the government has dispensed with the Indian agents they had there?—A. I was not aware of that, sir.

TRANSPORTATION SURER UNDER MILITARY THAN CIVIL MANAGEMENT.

Q. I would like to have you express your opinion upon this point, whether or not the method of doing business under the commissariat and quartermaster of the Army would not give greater facilities for supplying the rations which the government is bound to furnish or does furnish to the Indians annually than if these supplies were furnished by civil contract as at present under the Interior Department?—A. It certainly would do so.

Q. Would not the system of accountability, and the certainty of calling to accountability for malfeasance or misapplication of funds, or failure in any respect to discharge the duties of the office, be much more certain to meet the merited punishment under the military discipline than under the present civil method?—A. I am not familiar with the management of the details of the Indian Bureau or its system of accountability and responsibility of its agents and officers. I only know that in the Army, where losses occur through malfeasance, or neglect of duty, or from any other cause incurring losses to the government, our rules are very rigid, and every officer is held to the strictest accountability. Our system is such that it is impossible for an officer guilty of such misconduct in office not to be held accountable for it.

Q. Have you any knowledge in regard to the fidelity or otherwise with which the civil agents have performed their contracts in regard to furnishing the supplies issued by the government for the Indians in the neighborhood of military posts?—A. I have no knowledge of my own; my opinion is based entirely upon hearsay.

NOT SO MANY TROOPS NECESSARY UNDER MILITARY MANAGEMENT.

Q. I understood you to say, in answer to an inquiry by Judge Boone, that in your opinion the transferring of the Indian Bureau to the War Department, and the appointment of officers of the Army to act as agents for the various tribes, would not necessitate a greater number of troops at any of these posts, or near them, than at present?—A. My judgment is that in a few years the number of troops required at most of the Indian agencies would perhaps be smaller than it is at many of these agencies at the present time.

Q. In the course of your experience on the frontier, have you known of any instances in which there have been conflicts of authority between the civil agent and the military officer; or if disturbances grew up with an Indian tribe, and they became dissatisfied and war ensued, have you known of its being brought about by a difierence in the mode of treatment which the Indian civil agent wanted to pursue, and that which the officer desired to pursue?—A. No, sir; on the contrary, my experience has generally been that an officer at an agency—except where the Indians were extremely disposed to be hostile—has been in an entirely secondary position.

Q. Is that the case?—A. Entirely in a secondary position. In other words, that he has had but little, if anything, to do with the Indians, except in receiving orders from superior authority when called upon by the Indian agent.

Q. The Indian agent acting through the Interior Department?—A. Or the Indian agent himself individually acting, as the case may be.

Lieut. J. M. LEE sworn and examined.

The CHAIRMAN. We have been informed that you have had considerable experience in the management of the Indians, of what we call the wilder tribes, having acted as agent for some length of time. No doubt

a statement of your experience would be valuable to this commission. You have heard our object stated, which is more particularly as to the propriety of the transfer of the Indian Bureau from the Interior to the War Department. The commission would be pleased to listen to a general statement as to what you have seen, and also as to what you think would be for the best of the Indians and the government.—Answer. I was ordered by General Crook to take charge of the Spotted Tail Indians in March, 1877; they were then in the northwestern corner of this State. They numbered at that time about 5,500. I continued in charge of those Indians from that time until the first of last July, and of course had considerable experience with their ups and downs.

Q. Have you had any acquaintance with the management of the Indians under the civil authority?—A. Yes, sir; I have been stationed where I saw some of the operations of what might be termed the civil management of the Indians. I was stationed in the vicinity of Red Cloud Agency, and also at Spotted Tail Agency, for about three years, or nearly three years, during which time I was not Indian agent. Then I had some experience when I was Indian agent in Nevada for a year and a half, or nearly two years. That was 1869, 1870, and up to 1871. Of course, I know more or less about the management of those affairs, as I was in the performance of my duty, and I was called upon to look over certain records and get certain information, and many things transpired under my observation. I do not know as it would be proper for me to compare the administration of the civil agents with my own; I do not think it would.

Q. Were you not acting in the character of civil agent? Were you empowered by the military to do anything in the military line, or do anything except to discharge the duties of agent in the same manner as if appointed by the Interior Department?—A. I should perform the duties of Indian agent precisely in the same manner whether a civilian or an officer. I was detailed, as I understand it, under the law which authorizes any army officer to be detailed to act as Indian agent.

Q. The question I was getting at was whether you considered yourself as acting as a military man, or whether the duties that you were performing were only the same as ought to be performed by an Indian agent appointed by the Interior Department? That is, it took you, as it were, out of the military power and made you a civilian for the time being so far as your acts were concerned?—A. It took me away from my military duties and made me an agent under the Interior Department, and I reported the same as a civilian agent.

By Mr. HOOKER:

Q. Will you be good enough to indicate the period to which you refer?—A. I was with the Spotted Tail Indians from the first of March, 1877, until the first of last July.

Q. Then you spoke of having been engaged in 1869, 1870, and 1871?—A. From August, 1869, until March, 1871, I was in Nevada.

Mr. MCCREERY. Notwithstanding any consideration of delicacy, I think it is competent for the witness to state all the facts within his knowledge.

INDIANS OVERESTIMATED AS TO NUMBERS.

The CHAIRMAN. As I stated to General Williams, we are disposed to hear any suggestions these gentlemen may have to offer on this subject. We want to get at the facts. If there is any delicacy about speaking out, we hope you will not permit that to prevent you from making your statements full and complete. We wish to get at the comparative

merits of the different systems of managing Indian affairs. If a military man is better qualified than a civilian to act as Indian agent, we want to know it; and if there are any reasons to be given to sustain such an opinion, we want to know what they are.—A. I made a little memoranda to refresh my recollection. If you will allow me I will refer to the points to which I expect to speak. Lieutenant Foote, of the Army, was detailed to Spotted Tail Agency in August preceding the time that I took charge. He relieved a civilian agent—E. A. Howard. E. A. Howard was feeding, on paper, at that time 9,170 Indians. Lieutenant Foote, immediately after taking charge of the agency, made a careful census of the Indians, and the actual number was found to be 4,775. We had always maintained the belief that the number of Indians was vastly overestimated, and that there were very little more than half the number of Indians that were reported. Lieutenant Foote's census confirmed that belief. Howard, the civilian agent, was dismissed by a telegram from his position as agent, and Lieutenant Foote was ordered, I believe by General Crook, from the department headquarters, to take charge of the agency. He took charge and continued in charge a short time, when he accompanied the troops on a war expedition. Another officer, Lieutenant Paul, of the Third Cavalry, had charge for a short time, when he was succeeded by Lieutenant Neide. I relieved the latter officer. The Indian war was going on at that time. When I took charge, Chief Spotted Tail was out on a mission of peace, having been sent out by General Crook to the northern Indians. Things were somewhat disorganized; Indians were coming in and going out from the agency, and it was rather difficult to keep track of them. The Indians had pretty much their own way, and had had. The agent had to control them almost entirely by moral suasion, and he had extreme difficulty. The Indians, before the military took charge there, were prejudiced by Howard and others against any officer taking charge, Spotted Tail and others being told that when the officer went into the agency, a sentinel would walk up and down in front of his office, and that no Indian would be permitted to go in to see him unless carefully searched; and that they would have extreme difficulty in getting their wrongs righted; that they would be subject to discipline similar to the soldiers, liable to be put in the guard-house and very badly treated. Very soon after Lieutenant Foote took charge of those Indians, they made a request to a commission then visiting them to have Howard reinstated. They changed their minds, however, very soon after, finding that they were as well, if not better, fed by Lieutenant Foote than they had been by Howard, notwithstanding his estimate for the double number of Indians.

In speaking of this man Howard personally, I wish to state that I know nothing about his transactions, of my own personal knowledge. The Commissioner of Indian Affairs informed me that this agent had been placed there on the recommendation of the Episcopal Church or board, and that he was receiving $375 a month regularly, in addition to his salary—that amount in an unauthorized way. By an investigation afterward, which it was proper for me to make, in connection with receiving beef-cattle at the agency, I was informed by the chief herder that he was never known to reject a head of cattle offered by contract.

PROMISES TO THE INDIANS MUST BE PERFORMED.

The first thing that I did on taking charge of the agency was to look over and see what the Indians were entitled to under the promises made to them. I believed from the experience I had had in Nevada, and from the observation of Indians at Red Cloud and Spotted Tail, that if

they were well supplied and the promises were carried out, that an agent would have comparatively no difficulty in managing them; and I managed those Indians for a year and a half on that basis. I had no trouble of any material nature, but a great deal of aggravation and annoyance. I never had any guard around me. Two companies were stationed there. There were fewer stationed there when we had charge of them than when Howard had charge, he having at one time five companies. I never found the necessity of carrying arms among the Indians. A great many of them were wild. I never made a promise but what I could keep, because if I forgot it the Indians would remind me of it. On that theory I started out, and I kept it up.

I did make a fight for supplies, and I had great difficulty in getting them. Under the system that was then in existence, one man, whose name I will give—D. J. McCan——

IRREGULARITIES OF CIVIL CONTRACTORS.

By Mr. HOOKER:

Q. You mean the system under the Interior Department?—A. Under the Interior Department. D. J. McCan, under a corn contract for corn to be delivered for the Spotted Tail Agency, out of 356,000 pounds that he received, he succeeded in getting away with 180,000 pounds. Finally I succeeded in ferreting the matter up. The corn was purchased in open market. Flour he also succeeded in getting away with. It took me two months of hard writing and investigating to find out what had become of that corn. It had been received from Omaha west by him as transportation contractor. Action has been instituted against him, but I do not know the final result.

By the CHAIRMAN:

Q. You succeeded in getting the corn?—A. Yes, sir; and supplied that deficiency. The Interior Department brought suit in Cheyenne against the bond. That was one instance. That same transportation contractor diverted supplies from the various agencies until beans were followed to the Black Hills by an agent from the department at Washington, and they were seized there by the agent, from eight to twelve thousand pounds. This contractor would sell this corn, as I had affidavits of the parties buying from him. He would load a train for delivery at Red Cloud and Spotted Tail, and, with the inspector's mark on, the man would sell the corn for market price. It was a pretty clear case that he got away with the corn.

TREATY STIPULATIONS WITH THE SIOUX BROKEN.

The treaty with these Indians of 1868 is a very important matter. A great many things were promised that never were fulfilled, and perhaps a great many that cannot be. That treaty embraced 25,000 Indians, or thereabouts. One of the features of this treaty was that these Indians were to receive for 30 years in annuities certain specified articles, such as clothing, &c., for each man, woman, boy, and girl; and beside that, other articles should be delivered to them to the value of $10 per head as long as they remained Indians. When any settled down to agricultural pursuits they were to receive certain benefits to the extent of $20. When I took charge of the Spotted Tail Agency the annuities were going on according to the estimate of the number of Indians by Howard, and would have amounted to over ninety thousand dollars, and even more than that—to $90,000 besides these specific articles mentioned. The annuities that came on his estimate for issue to these Indians

amounted to $25,000. There was a case where the Indians did not get one-fourth of what had been promised to them by the treaty. The difference in making my estimate was that I made my estimate on the basis of the treaty. I went to see what the money value of the articles was, and footed it up, and made out the annuities when they came to the Missouri River, by the time the Indians got there—I think the estimate was on the basis of 6,500 Indians—at about seventy-five thousand dollars. I merely mention that as one instance where the Indians did not receive what had been promised to them. In all my talks with the Indians they bring up these promises which have been broken. They fear they are to be deceived, and of course leave their agencies, particularly when not well supplied. I had no difficulty in keeping the Indians at the agency, so far as my jurisdiction or so far as my duties went, so long as I could redeem these promises to feed them as the government had promised they should be fed.

Q. Good faith on the part of the government is one of the essential things in the successful management of the Indians?—A. It is unquestionably one of the principal things necessary.

CAUSES OF INDIAN WARS.

By Mr. McCreery:

Q. Bad faith you regard as one of the causes of the wars with the Indians?—A. Yes, sir. As described by General Williams, the character of the Indians is such that they are not going to submit to these things. They do not investigate matters very closely. If you tell an Indian that you are going to give him a pound of tobacco, and then explain that the boat did not come, he does not take those things into consideration. He knows you made the promise, and thinks you had no business to make it unless you were ready to fulfill it. He jumps at his conclusions; takes his own method of revenge; starts out, and conceives every white man to be his enemy, and he kills the innocent as well as the guilty.

INDIANS DESIRE TO CULTIVATE THE SOIL.

I did not believe that any of the Spotted Tail Indians would work. When I took charge of them I believed as a great many people do, or did then, that these Indians would not go to work. There was a move on foot, in the spring of 1877, to move these Indians to the Missouri River. An agreement had been made, with a number of articles in it, many of which I did not understand, and I do not think the Indians very well understoood them. They were to be removed in June, 1876, I was informed by the Commissioner of Indian Affairs. I wrote on to him that some of the Indians wanted to plant, and he said not to encourage them at all. Spotted Tail had not returned from the north, but sent word that they were coming in, and that peace would be made. I communicated with General Crook in regard to the matter, and he told me if the Indians wanted to go to work, to do what we could to encourage them; he did not think the move would be made in June. We wanted to get them to settle down for a while. I called the Indians together, and, to my astonishment, I found from 150 to 200 families that wanted to plant; but I could not get any money to buy anything. Some of them agreed to plow and did plow. I took down the size of the patches of ground—about what they could cultivate—and on my own responsibility, having the assurance of the department commander, I sent to Omaha and bought some seed, and hired some plowing done where the Indians could not do it themselves. The expense was about $600. The

men would build fences and carry the poles, where they had no wagons. They talked about these little farms of two and three acres, and half an acre, with all the enthusiasm of an old farmer. They were very much interested in them. They did not know anything about farming, or but very little. But there were from 150 to 200 families started at that time, and if they could have been put on a ten-acre field apiece, with some one to take charge of them, and plenty of seed, they could have raised a good crop.

INDIANS' PREFERENCE FOR STOCK-RAISING.

Q. They could be made self-sustaining in time?—A. In a great measure; not all of them; I do not think all of our white people are. That rather disabused my mind in regard to these people. I began to investigate this matter, and I found four or five thousand Indians around that agency that, with proper treatment and care in fulfilling promises made to them, could be kept at the agency and spread out on good land and put to stock-raising. That is the thing they wanted to go into, and have for a long time. They have a preference for that kind of labor over agriculture.

Q. So I supposed.—A. They had these places fixed up as well as they could, and then came the order in the fall to move. They moved the Indians to the Missouri River. As agent there I was opposed to moving the Indians to the Missouri River at that time, notwithstanding any agreement to the effect that they should be removed, because it was very plain to be seen that the instant the movement was attempted the Indians from the north, who had surrendered the preceding spring, would drop off from those agencies, they having a dread of the Missouri River, it never having been their home, and they fearing that they would be treated as the Poncas had been, and sent down in the Indian Territory or away. It would only unsettle matters worse. But the move was finally determined upon, and before it was determined upon every Indian agent was against it. It was determined that they could go there and get their supplies in the winter, and in the spring be permitted to move back to White River. With that promise, which was made by the President, which was repeated again and again by the Secretary of the Interior to the Indians, which was sent to me, and which I used in getting them to consent to go, we started out the last of October to make the trip. The Spotted Tail Indians moved nearly 300 miles. The result of it was that I got over with about six thousand Indians. I think about 2,500 Indians left the Red Cloud Agency and went north. They were the same ones that surrendered the preceding spring. I got them through; they had hardships of course; there were no means of moving them. The military furnished all the transportation possible, and the Indians had to move themselves. The old had to get along as they best could, and the sick died of all kinds of hardships. It looked to me to be barbarous to move those people at that time.

The CHAIRMAN. I told the Interior Department myself that that would be the result of it.

Mr. HOOKER. Please proceed with the narrative of the removal.

The CHAIRMAN. You may continue your statement as to the removal to the Missouri River and the promise to let them go back, and whether or not it was carried out.

SUFFERING OF THE SIOUX IN REMOVING TO THE MISSOURI.

The WITNESS. I will not detail the hardships of those Indians; there could be a volume written about them. I think it was one of the most

barbarous outrages ever perpetrated upon a people to remove them at that time, and it was so represented to the Interior Department, to say nothing of the bad effect upon the Indians who got through. They got there, and had immediately to clean away the snow and put down their tepees, when they were raided by the white men and their half-starved stock run away. That was the reception. The Indians looked upon it from their standpoint. That was the first thing done upon the Missouri River. The next thing, I found that a matter had been cooked up to break a promise in regard to issuing beef. Twenty-five hundred head of beef were to be killed and frozen and put up in warehouses, and these Indians, scattered out 15 and 20 miles, could come in and draw the frozen beef. That was a new idea. There had been a reduction made in regard to the contract for that. We had always issued to them every ten days, giving the beef on hoof, so that they could utilize every part of the beef. Seeing the way things were going (I had promised the Indians that I would remain with them and see that the promises were carried out; that they would be treated the same on the Missouri River as they had been treated before, and would be moved back in the spring), I asked to be relieved, and then I received orders to receive these cattle and hold the herd for the winter. If I had killed them I would have lost heavily, as the warm weather following January would have spoiled the meat. The Indians staid there during the winter. The place was muddy and disagreeable, and a great many of them had to scatter around. They were raided by bad white men and constantly stirred up, invited to cross the border, to do anything and everything. Some parties came more than a hundred miles for the purpose of this illegal traffic, getting the Indians to leave the reservation and go across, and it kept me on the go to keep them back, and finally I had to make them move back from the border—back from the stream.

They managed to draw their rations and get along during the winter, and when spring came I again, for reasons of my own, asked to be relieved. I was ordered to Washington, and I was again told that the promises to these Indians would be kept. I had a final council with the Indians, and thought if the promise was to be kept I would remain with them; but if not, they would accuse me of lying to them, and it would break my power and usefulness as their agent, and I did not care to remain. I was assured that it would be kept, and I so informed the Indians. I telegraphed to Spotted Tail and others that there was no going back on those promises. This was February, 1878. The following March came. When there, I was asked as to the best time in March to get ready. I told them to set it in April—to get everything all ready by the latter part of April. I came back. The Indians were very glad, and everything went along smoothly and harmoniously; they lived away from this border; they raided nobody; not a depredation was committed by any of these 6,000 Indians for some months. April came. I wrote on, sending the estimate necessary for the move, and May came and nothing further was heard about it. There was some question about some appropriation, and they could not make the move until that was received. Still I could receive no definite answer. Finally I sent a telegram. May passed. We succeeded in keeping the Indians quiet through May, though they were becoming very restless. June came finally. I was afraid that a great many of them would break away and leave, and then, of course, there would be no restraint. The latter part of June a commission came there to find out the place which they had selected. The place selected by Spotted Tail was on the South Fork of White River.

By Mr. HOOKER:

Q. A commission sent by whom?—A. The Interior Department, I presume; appointed under instructions from the President. That commission came there for the purpose of trying to induce those Indians to stay on the Missouri River; also under instructions, as I saw them printed in the papers, that there was to be no bad faith with the Indians; that all promises were to be kept. They were to look at the place if the Indians insisted on going out. The commission said they could make it to the interest of the Indians to remain on the Missouri River, which was to give about $25,000 to each agency. That was all the money that would be paid for transporting their supplies. This amount was to be given to them in the nature of presents. But Spotted Tail stated the case pretty clearly as to the promises which had been made, and he had the printed pamphlet, and he demanded that the terms be complied with, and in his case they were. The Indians moved themselves and got out on the South Fork of the Rosebud. They got there in August. The promise was to have been carried out the preceding April; as soon as the "grass grew" were the words.

By the CHAIRMAN:

Q. Are these annuities paid to these Indians in articles needed to supply their wants, or do they receive cash annuities?—A. They do not receive any cash at all. The annuities run for 30 years from 1868. Their rations run forever or until they become self-supporting. Their rations come under the agreement of 1876, ratified in 1877, for the relinquishment of all their rights to the Black Hills, the country east of the Bighorn Mountains, I believe.

HONESTY IN DEALING WITH THE INDIANS ESSENTIAL.

Q. To sum up, you think proper treatment is what is required?—A. Proper treatment and strict honesty. In regard to the supplies of the Spotted Tail Agency, the Secretary of the Interior told me himself that since the military officer had been in charge of that agency the average weight of the beef had fallen from 1,040 to 840 pounds, which at the Spotted Tail Agency was a saving to the government of $36,000 a year. He referred to Howard's average, of course, he having been agent for some time before. To my certain knowledge the Indians were fed quite as well under the reduced average as under the higher average.

In reference to the supply question, there is a system in vogue now in the Interior Department, to which some citizen agents have objected, of having a military officer from the nearest post present to witness the receiving of supplies, verifying the weights, and examining into the quantity and quality of supplies that are furnished. Some citizen agents take exceptions to it, as being a reflection upon their honesty. While I was there as agent, there was a military officer who came from the post, and I was glad of it, as it helped me very much in determining matters.

INDIANS DO NOT OBJECT TO PRESENCE OF TROOPS.

In regard to the troops stationed at the agency, there have always been two companies at Spotted Tail Agency since I have been there. There never was any complaint made to me by the Indians on account of the troops being there. I had frequent occasion to call upon our troops to pursue horse-thieves and to expel bad men from the reservation, and no one objected. They were used for the benefit of the agency Indians. In regard to other matters, where troops were kept under proper discipline, and the agent attended to his business and be-

haved himself, there were no evil effects that I have ever observed. I never heard any complaint from a chief in relation to matters of that kind. On the contrary, the very best feeling obtained between the Indians and the troops since they have been stationed there; for while Spotted Tail and other chiefs who have been at the agency a long time know they are there to hold in subjection a bad element among the Indians, they know also that they are there to protect the Indians from the encroachments of white men by stealing stock, introducing whisky, and things of that kind. I have never had any trouble on that score. I find that these troops are like other people. I do not think they are as bad—I know they are not—as a class of white men who have been permitted to remain among and intermeddle and live around this agency. I would not say all, for there are some good men among them, but the majority.

Q. What course would you advise in treating with the Indians, if called upon for that purpose, in reference to the improvements which we wish to introduce among them? Would you advise that we try to make agriculturists of them or stock-raisers?—A. I find that a great many of the Indians are very fond of wagons. You cannot please an Indian any better than to give him a good wagon. He will haul his rations and wood with it; and pretty soon, if he finds an opportunity to make a dollar, he will work for it. Transportation with them is quite a thing. They like to handle animals. There were several Indians, perhaps ten or a dozen, who would start out with teams, and go through as far as Sidney and other points, and haul rations. They are very fond of stock-raising. They take to that better. But a number of them are agriculturists. That does not seem to be the first thing, however; it seems to follow afterward. After living around an agency a long time, he selects a little spot where he gets his grass, and where his ponies range, and every year he will fence in a little and put in Indian corn, if encouraged and shown how to do these things. The trouble is nobody has instructed them. At many of the agencies there are great magnificent agency farms, with white employés and a few half-breeds. The Indians with blankets will sit on the fence and see these men raise a big crop to make a fine report of, to be published in book-form every year. That is about the way these things go. They will take to these things, however. A wild Indian chief surrendering will not do it, perhaps, for three or five years, perhaps not for even a longer time. There is no reason why they should not be self-supporting in a measure within the next five or six years, if properly managed and properly cared for.

In regard to inducements to be held out, the Department of the Interior sent me instructions at one time, when I was in rather a close place—I was aggravated and annoyed, and the Indians were in the same state, on account of the removal question—to cut off all rations to those Indians excepting those who worked. There were no facilities for working; nothing to work with. This was to cut off all sugar, coffee, beans, and rice given them before. Those who worked were to receive them.

They got a little flour. I wrote back and asked if that was to apply to my agency; they replied that it was not. There was a case where, if I had complied with the instructions, I would have driven many of my Indians away, perhaps to commit depredations, killing somebody and stealing. There is an agreement made with these Indians that when located where they can go to work, those who will engage in some sort of work shall receive more rations. That thing is very easily fixed. I take these five thousand Indians where they are now, and I would lay out their farms for them, that is, those who desired them, and I would say to those Indians who worked, "You are doing so much I will give you

a little bigger weight on your sugar and coffee, a little extra." I say to the Indian who does not work, "I cannot give you so much, because the man who works must eat more. If you work you will receive the same as the others who work." He will probably fall in in time, maybe the first year and maybe not until the second year. When you get the bulk of the Indians on your side you can tighten the grip by degrees. I was careful in attempting experiments. I tried to deal squarely with them and got along without serious difficulty.

INDUSTRIAL SCHOOL NEEDED AMONG THE INDIANS.

Q. Has any effort been made to establish schools?—A. Yes, sir; a day school was started there, but it has done about as much good to those Indians as pouring water on a duck's back. They have translated books and tried to build up a Sioux language. Sioux hymn-books, dictionaries, spellers, and all that sort of thing, and tried to instruct them in that barbarous language. The children would go to school for a few days to keep warm, and once in a while one would learn something. It amounted to no practical good. It was a school under the patronage of church denomination. The only kind of school they need, and what they ask for, is an industrial school where, while they can learn something, they can acquire a trade and can also do some work. There are enough waifs to start a school of 150 pupils at Red Cloud and Spotted Tail Agencies. They can learn readily and will work. As to the day schools which we have in vogue among white people, I do not think they are prepared for that yet. Perhaps these industrial schools would have been started at these agencies were it not that they were on the constant move. They have no opportunity of perfecting them.

By Mr. BOONE:

Q. The drift of your evidence, if I understand it, is that with proper treatment and honest dealing and encouragement a large part of these Indians may be very greatly improved. My question is whether or not Army officers generally, if they are appointed to take charge of these agencies, in your opinion, would take the necessary pains and have the patience to carry them through? You need not hesitate on account of being an Army officer.—A. This has been my rule in life, wherever placed I try to do my duty. That is the rule of every good officer. If he does not do that he runs a chance of being put out. I have been much dissatisfied with my work at Spotted Tail Agency in many respects; yet I do not believe any one could have worked any harder for those people than I did in trying to do what was proper and just for them. I do not think it necessarily follows that an Army officer should have charge of the agency. The present system I have found fault with because it has scarcely any checks at all. Where a transportation contractor can make out his own bills of lading and keep forty or fifty thousand pounds of government stores and nobody know about them, that system is bad.

By Mr. HOOKER:

Q. You refer to the Interior Department?—A. Yes, sir.

ARMY OFFICERS ADAPTED TO THE MANAGEMENT OF THE INDIANS.

By Mr. BOONE:

Q. There is a proposition to turn the management of the Indians over to the War Department with a view of putting Army officers in the place of civil agents. It is very essential that we should have the opinion of men of experience, and as you have had considerable experience

among the Indians and in the Army we would like to have your opinion as to whether or not Army officers would be suited to that character of work.—A. As a general rule as much so as civilians. In answer to your question, of course, I can only speak from general information. The report of the Commissioner of Indian Affairs for 1870 and 1871, when the supernumerary officers were detailed to take charge of the Indian agencies over the country, speaks in the very highest terms of the good effect of their administration. Some of those same supernumerary officers went out of the service of their own accord, and in one or two cases I can call to mind they are now Indian agents and of the very best of Indian agents. I can only repeat what the Commissioner reported himself at that time of the administration of Indian affairs at those various agencies. Army officers were detailed in one general order from the War Department in 1869 to take charge of those agencies, and the Commissioner reported it as being highly satisfactory. I think this, that if the system of supplying these Indians, if the system of inspection was the same and could be as effective, it would make no difference where the Indian Bureau was, provided men who had some knowledge of Indian affairs were put in charge of them. But there is this certainty, that a man who knows nothing about the Indian, who goes out to take charge of Spotted Tail or Red Cloud Agency, or an agency of that importance, who has got some theory of his own that he has never seen tried practically and knows nothing about, and attempts to put it in practice, may stampede most of his agency. For that reason those of experience should be put in charge of those agencies, because while in some respects they might not come up to what might be desired, yet if some one else had been there who had not had the experience very undesirable results might have followed. If the bureau was under the War Department and an officer inspected as under the Interior Department, and these civilian agents were under the War Department and under the control of the department commander, I do not see that a military officer need be detailed to take charge of the agency. For myself it is a duty I should never desire. It is not my legitimate duty.

ARMY OFFICERS DO NOT DESIRE THE TRANSFER.

Q. What has been your observation among Army officers as to whether or not they desire this transfer?—A. I do not think they desire the transfer; they do not desire that kind of duty. As remarked by several officers to me, while it might be a very good thing for the Indians it would not be so good for themselves. They do not care for duties of that kind.

By Mr. STEWART:

Q. You think to successfully administer Indian affairs, whether by civil or military authority, the agent ought to be a man experienced in Indian affairs?—A. He ought to be a thorough Indian man.

By Mr. HOOKER:

Q. If you have any other facts pertaining to your administration of Indian affairs, either during 1877 or the prior period of 1869 and 1870, we would be glad to receive them.—A. There is of course a great deal I might say.

By Mr. MCCREERY:

Q. If you have any facts relating to anybody else's administration, please state them.—A. By this treaty with the Sioux of 1876, ratified in 1877, there has been almost practically an established religion at each of these Indian agencies.

NON-DENOMINATIONAL RELIGIOUS INSTRUCTION DESIRED.

By Mr. HOOKER:

Q. What has been the effect of that?—A. The effect has been bad. Under the treaty of 1876 various religious denominations were allowed to nominate certain men to take charge of these agencies, and they were appointed on those recommendations. Such men as Saville, of Red Cloud, and Hastings and Howard—both the latter dismissed about the same time—and a great many others up the Missouri River, where they reported great frauds had been unearthed. They nominated these men who professed to be good men and all that sort of thing. When there they would as a rule discourage any other denomination from doing anything. At the Spotted Tail and Red Cloud Agencies they have been asking that Catholics be permitted to come among them as well as other denominations. The Indians ask it. They had an idea that Catholics would introduce industrial schools. They have asked for them. Under the treaty of 1876 it is provided, under the construction of the Interior Department, that no person other than the farmer, agent, trader, or employé shall be permitted to reside on an Indian agency who is a single man. He must be a married man. Of course that would prevent a priest from living there. However, when a priest came to Spotted Tail Agency I told him I could see no objection to his coming there notwithstanding that. If the department ordered him away I never got the order. A great many of them have been asking for Catholics as well as other denominations. That has been practically denied them, and it is looked upon with disfavor. An agent who is appointed at the solicitation of any church, whether it be Catholic, Episcopalian, Methodist, or whatever it may be, the result has been, so far as my observation has gone, he will encourage his own sect and discourage the others; and of course the Indians have become highly incensed. They attribute many of their misfortunes to the denomination that has charge of it. They hold them responsible. Whether unjustly or not, still they think that they are responsible. In fact, persons connected in that way have mixed up with Indian matters, and have written reports through different channels, and in that way weakened what the agent would report to the Indian Office. If they would confine themselves to their religious instruction great good might come from it. I speak of individuals, and not of the denominations. This thing has induced me to report on the subject to the department repeatedly. I think the Catholics as well as the other denominations ought to go among those Indians.

By Mr. BOONE:

Q. Leave it open to all?—A. Yes, sir; the Indian is consulted about what he shall wear, eat, and do in many things, and all his wants except his spiritual wants; and to say to him, if you want a Catholic you shall not be saved except by a Methodist, is pretty hard.

Mr. STEWART. Especially when he is so anxious to be saved.

Major ANDREW S. BURT sworn and examined.

By the CHAIRMAN:

Question. Where are you located?—Answer. I am on duty at the garrison near this place.

Q. Have you had any experience with the Indians at the Indian agencies, or in any way, in an official capacity?—A. I do not know what you mean by experience.

Q. Have you held any official relation to the Indians?—A. I have

been among Indians since 1866—almost every tribe north of the railroad.

Q. You belong to the Army?—A. Yes, sir; I am captain of the Ninth Infantry.

Q. As I understand it, a military officer, unless he is detailed to the position of Indian agent, is not necessarily connected with the Indian Department?—A. No, sir; I have never had any experience with the Indian Department, I am glad to say.

Q. From your observations in regard to these matters, would you give it as your opinion that it would be better for the government and the Indians, or either, to have the Indian Bureau transferred from the civil to the military department? If you deem the transfer advisable, please give your reasons for so thinking.—A. The gentlemen who have preceded me have so ably given my views upon this subject that I have hardly anything else to say, so far as my experience has gone.

THE TRANSFER SHOULD BE MADE.

Q. You concur, then, with the gentlemen who have preceded you?—A. There is no question about its being the right thing to do for the Indians, but of course it would be a bad thing for the Army to transfer the Indian Bureau to the War Department. That is my opinion based on my experience since the year 1866.

Q. Does that opinion grow out of the fact that the military are better qualified for the work of governing the Indians than the civil department is; that is, if you had the same character of men in the civil department that you have in the military, would there then be any difference?—A. The whole schooling of the Army is that of strict obedience to orders, industry, a strict regard for honesty, which, if not compulsory, is secured in most cases by a sense of honor that is prevalent in the Army. An officer cannot go outside of the line of duty or honor or honesty and not suffer in his reputation and place by it.

Q. What I would like to know from you is, whether, in your opinion, if the same character of men were selected for the Indian agencies by the Interior Department as would be selected if the bureau were turned over to the War Department it would not be just as well for the Indians and the government?—A. Undoubtedly. Honor and honesty and faithfulness are the same, wherever you find them, either in civil or military life; and I do not mean for a moment to say that Indian agents chosen from civil life are not honest as a class; but I think they are exposed to temptations, without adequate safeguards and restraints, in the system under which they act, and that is the trouble with many of them. When an Indian agent does wrong, as the system is at present constituted and conducted, I understand that he is not accountable to anybody. So far as my knowledge has gone, I have known of very few ever having been punished for malfeasance or for any cause; and I know of no Army officer who has done wrong who has not been punished for it, and in some cases put out of the Army. This dishonesty of agents and others appointed and permitted to be over the Indians, and have the handling and distribution of supplies to them, has been the great source of trouble with the Indians—the secret source of the trouble.

INDIVIDUAL RIGHTS TO LANDS DESIRABLE.

There is one special point in which, in my opinion, you gentlemen can do a very great deal of good, and that is, you can appeal to Congress to give these Indians individual rights to their lands. This summer I was talking with a chief of the scouts of the Arapahoes on that point. I

thought the time would come when they could have individual rights the same as white men, and the same rights before the courts as the whites. He was fully impressed with the idea and the importance and desirability of securing that end. He said that their old men had been talking about it among themselves, and he was going back to advocate it. He expressed himself as warmly in favor of it.

Q. What tribe or tribes of Indians have you been best acquainted with?—A. With the Crows; I have been associated with them for a long time. I was up in the Big Horn country. They boast that they have never killed a white man; they are the least warlike Indians on the plains; that is conceded. Black Foot sent word down to some of his friends that he did not know how he was going to bear it; with the Sioux on the one side, and the whites on the other, his men would not have enough land "to sit down and do a job upon" (that was the way he expressed it). All this was owing to mismanagement. Talk with such men as Dr. Irwin, and no one can control Indians better than he, and he will confirm the general facts.

ACCOUNTABILITY OF AN ARMY OFFICER.

The system of supplies and of orders, and the system of issuing goods and rations, is far superior in the Army to the civil mode of procedure. Our absolute system of vouchers makes a proper return in every case certain. The perfect accountability that an officer of the Army has to maintain in all his transactions is a great point. However, if an Indian agent had his commanding officer to see that he did his duty; if he had the department commander to see that he did his duty, and then the division commander to oversee his official acts, and behind that the War Department, and all these backed up by the solid foundation of honesty and the training and discipline that the soldier necessarily has undergone in the art of doing every part of his duty thoroughly and well, I have no doubt that in such a case the Interior Department could do as well as the War Department in the management of the Indians.

By Senator McCREERY:

Q. I understand, major, that you simply indorse the statements of the former witnesses?—A. Yes, sir.

Brigadier-General GEORGE CROOK, commander of the Department of the Platte, sworn and examined:

The CHAIRMAN. You have heard the statement of the objects which this commission have in view, as made to the other witnesses. We would like to have your opinion as to whether or not the transfer of the Indian Bureau to the War Department would be advisable—better for the Indians or for the government; or if you have any better system to suggest for the government of the Indians, we would like to hear it.

The WITNESS. I have nothing better to suggest.

By the CHAIRMAN:

Question. Do you think it would be better to make a change from the present system of management to that of the military?—Answer. I think there is no doubt that some change would be beneficial, both to the country and to the Indians.

HONESTY ESSENTIAL IN DEALING WITH THE INDIANS.

Q. State to the committee your reasons for so thinking—in what particular or particulars it would be an improvement on the present system

to turn the bureau over to the War Department.—A. The Indian is a child of ignorance, and not all innocence. It requires a certain kind of treatment to deal with and develop him. One requisite in those who would govern him rightly is absolute honesty—a strict keeping of faith towards him. The other requisite is, authority to control him, and that the means to enforce that authority be vested in the same individual. As it is now, you have a divided responsibility. It is like having two captains on the same ship. For this reason specially, the necessity of unanimity in action, I think there can be no question but the management of the Indians should be placed under the control of the War Department; there is no comparison at all between the advantage that would accrue by putting the matter in the hands of the military and that which comes from allowing it to remain where it is at present.

RETIRED OFFICERS SHOULD NOT BE APPOINTED AS INDIAN AGENTS.

Q. You think it would be better to give the power to the military themselves, in the vicinity, to transact the military as well as the civil part?—A. Unquestionably. It should be left to the department commander, because all the military officials would not be fit for Indian agents—you would have to select them. Some men are capable and well educated, and would make fine soldiers, who would not do as Indian agents. It requires a broader-minded man than you will sometimes find in an otherwise well qualified soldier and officer. The position of an Indian agent is one that requires a man who is familiar with the subject and with the needs of the case in every detail, and the commanding officer would have to make a careful selection from the officers in his command, with reference to his special fitness for the government, control, and general management in every way of the Indians. I have heard a good deal of talk about putting on retired officers. You could not make a worse mistake than to do this, because many of these officers have gone on the retired list to get out of hard work, and to be an Indian agent requires the most arduous labor a man can be put to if he would faithfully discharge his duty.

Q. The idea has been expressed that the civil authority should rule—should be the supreme rulers as they are at present—that is the reason why I desired to have your opinion whether you thought the military ought to take full charge, independent of the civil authority?—A. As I understand it, the civil authority is supreme now in the government of the Indians; they control the War Department and the War Department control the Indians. There should be no divided responsibility. There is the great trouble in the case.

INDIANS DESIRE TO BECOME SELF-SUSTAINING.

Q. Would you advise that a course of management should be pursued which would have an eye ultimately to making the Indians self-sustaining—that is, that would have an eye to bringing them up to the habits and conditions of civilization, encouraging them to hold their property in severalty, &c.?—A. Unquestionably. There is no reason why the Indians should not be self-sustaining. There is no reason why the country should sustain or support any portion of its population in idleness. The Indians can be made self-sustaining, and they are willing to become so—all they want is the facilities and the proper instruction. Of course, you have got to use a little force. I have had twenty-six years' experience with the Indians, and I have been among tribes where I spoke their language. I have known the Indians intimately—known them in their private relations—and I think I understand the Indian

character pretty well. I know all the tribes on the Pacific Coast, from the British line down to Mexico. There were tribes in California when I first went there that were as wild as the wildest Indians in the country. To-day they are self-sustaining; they have their little farms, and are living in communities in the State, and are more law-abiding and better to do than many of the white communities.

Q. What number of them?—A. Two tribes especially, one called the Simcoe Indians—whether that is their real name I do not know—in Washington Territory, and the other the Warm Spring Indians. My first experience with the Indians was with these people. I know that they were first as wild as any Indians could be. I think I have never come in contact with Indians who were as treacherous and as hard to control as the Apaches. It was a hard thing to subdue them, under the circumstances, and after they were subdued there was one band in particular for whom the commanding officer of the post got a few hoes and picks, and with these, together with sticks hardened in the fire and sharpened, they broke up the ground, and they raised over two hundred thousand pounds of corn and thirty thousand pounds of beans. They sold the beans to the commissary and got the money. There was not the least trouble in the world to have them all engage in this farming work. Of course it required a good deal of hard toiling from them, but they were willing to do it. Then it required also some one to take an interest in them and to be willing to lead them and teach them; somebody broad enough and comprehensive enough to take in the whole subject. It can be done, however. They talk about breaking up their tribal relations. The Interior Department have frequently issued letters, &c., looking to that. It might just as well try to break up a band of sheep! Give these Indians little farms; survey them; let them put fences around them; let them have their own horses, cows, sheep, things that they can call their own, and it will do away with tribal Indians. When once the Indian sees that his food is secured, he does not care what the chief or any one else says. He is willing to stick to his own. He can see that there is sense in it. The Indians talk a great deal. They say: "We have nothing left for our children. We want to make a home for our children, so that when we die they shall not be thrown off as outcasts. We know how you live, and why don't you fix us as you are fixed? We know that you have land that you call your own and nobody can take it away from you. Fix us that way; survey it, put stakes around it. You have great advantages over us. You have the very best of moral training—the best people to instruct you. But you only send out to us such people as you don't want yourselves, and that is hard business." The great mistake these people make is that they go to looking after the spiritual welfare of the Indians before securing their physical. Of course that is a thing to come after awhile.

INDIANS SHOULD HOLD PROPERTY IN SEVERALTY.

Q. Do I understand you that you would not advise the hasty division of the property, and the breaking up of the tribal relation, nor the dividing of the property so as to enable them to make it their own; would you advise that the property be held in severalty, or allow them to continue their tribal relations?—A. In severalty. That is the way they desire to have it. Go to Spotted Tail and Red Cloud, and they will tell you, "Give us our lands, and we will select them"; and when you get a majority working this way and asking for this, the others very soon fall in.

Q. What would you advise on the subject of schools? Would you ad-

vise that schools be introduced among the Indians as early as possible, to teach them our language?—A. Secure their homes first. When an Indian has his home secured to him, he will then begin to think of something else. You cannot make him believe in a Great Being, as we say, "on an empty stomach." He wants to know, if all these great blessings come from the Almighty, why he don't see anything of them. They are hungry and want to see practical facts. You have got to look to their physical welfare before looking to their spiritual welfare.

Q. We found in the Indian Territory some tribes that had made considerable advancement in civilization, but still they were inclined to hold their property together; they do not want it divided. I was a little astonished at that.—A. That was the wish of the Indians in the Indian Territory?

Q. You think, then, that early steps should be taken to divide up the property among the Indians?—A. Yes, sir; that is what they desire.

By Mr. HOOKER:

Q. You speak of the Indians in this department?—A. I speak of them all. In this department there are very few Indians at present—the Shoshones, Bannocks, and the Arapahoes are about all.

Q. Did you mean to include in your remark the five civilized tribes—the Cherokees, Creeks, Choctaws, Chickasaws, and Seminoles?—A. No, sir; I know nothing about them; my experience has never touched them.

By the CHAIRMAN:

Q. It was a portion of these that I alluded to.—A. I know nothing about them.

CIVIL INDIAN AGENTS NOT ABLE TO ENFORCE AUTHORITY.

By Mr. HOOKER:

Q. You spoke of divided authority under the system of appointing the Indian agents and conducting the Indian management by the Interior Department; what is the authority or power which the agent himself ordinarily has, as given to him by the terms of his appointment by the Interior Department, and is he capable of enforcing that authority at all?—A. These agents are not capable of enforcing their authority. Of course there are a few Indian agents who are men of great force of character, and they are able to enforce a certain amount of respect from the Indians; but as a general proposition they cannot. They must have power to enforce their authority.

By Mr. MCCREERY:

Q. Do I understand you to say that you have had twenty-six years of service?—A. Yes, sir.

Q. What is your present position?—A. Commander of this department.

THE TRANSFER SHOULD BE MADE.

Q. And after this twenty-six years of experience it is your opinion that it would be better for the Indians and better for the government that the War Department should take charge of the Indian Bureau?—A. I have no doubt about its being preferable to the present management. There may be something else better, but I do not know what it is. With reference to the present management of the Indian Bureau, and this divided authority, I think there can be no doubt about the propriety of a change.

Q. Are you able to give any facts with reference to the mismanagement of the Indian affairs at any of the agencies, under the Interior Department?—A. Of course I have seen a great deal of that kind of thing, but in a general way. I would have to think, so as to recall any details. I have instructed my officers, as a general thing, that it was none of their business what the Interior Department did, unless it came to a question of authority between the two; so that I have got out of it so far as I could. We came in pretty close contact in Arizona. We had rather heated weather there, and a contractor came to me and begged me to stop fighting, because, he said, he could not get his appropriation so long as the fighting continued, and he wanted very much that I should cease hostilities. I said to him that I was only fighting in self-defense, and that so far as his transaction with the government was concerned, I had nothing in the world to do with that; but I had promised these Indians that they should be fed; and I told him, furthermore, that if he stole from the government that was his lookout; but that if he should undertake to steal from the Indians, he had me to fight. As a consequence the war ceased.

By Mr. BOONE:

Q. You have had some recent experience with the Cheyennes, I believe?—A. Yes, sir.

Q. Please to tell the commission what their present condition and inclination are.—A. After the war in the spring of 1877, these Indians came in. There were about one thousand of them. I had a talk with these Indians at the Red Cloud Agency, and I told them that there was an order out for the Sioux to go to the Missouri River, and that probably they would have all to go. Said I, "If you want to go down to the Indian Territory and join the rest of your people there, you can do so, but it will rest entirely with you." After a long talk they concluded rather than to go to the Missouri River, they thought that they would go down and try it in the Indian Territory. I got this as coming from them, and through people in whom I have confidence. They felt that General Mackenzie, who took them down, to use their own words, "threw them away"—that is, cast them off. They meant that General Mackenzie was ordered down to Texas, and went away from them. They thought that they were not well treated, and that if they could get to this department then they would be satisfied, for they thought that Lieutenant Clarke and myself could fix it for them to remain, and that they would thus be better off. That is the reason for their starting this time.

INDIANS SATISFIED WITH MILITARY MANAGEMENT.

Q. Have you heard or known of any complaints upon the part of the Indians where they have been under the management and control of the military authorities of this department?—A. No, sir.

Q. The complaint against General Mackenzie was, that he, being ordered away, was taken away from them?—A. Yes, sir; that he did not take care of them, in other words. One thing the Indians speak of. They say that in olden times the chiefs were fed—had plenty to eat; but they say that now everybody gets fed. In olden times the Sioux were numerous, the Cheyennes small, the Arapahoes small, and the issues were made to the Indians generally, and the Sioux only gave to the Arapahoes and Cheyennes what they did not want themselves. Consequently, they generally got poor. When we had charge of them every Indian got his just dues. They often refer to that.

By the CHAIRMAN:

Q. The committee would be glad to hear any further statements from you.—A. If you would indicate some point, I should be happy to reply.

Q. We started out to fulfill the law under which we are acting—to inquire into the subject of the transfer of the Indian Bureau from the Interior to the War Department—but we are glad to listen to any statements on the part of gentlemen who have had extended experience.—A. I shall be glad to respond to any questions you may put.

By Mr. HOOKER:

Q. Are you familiar with the circumstances under which the war with the Nez Percés broke out?—A. Yes, sir; I have a general idea of it.

Q. I would be glad to get your views on that. In a recent visit to their camp, and also to the camp of the Modocs, we found a great deal of disease and dissatisfaction prevailing among them, and I wanted to get your views in reference to the facts, as to whether the country from which they came into their present reservation in Indian Territory would be better for them from a physical point of view, and whether they might not be better managed there by the government than where they now are?—A. The Indian attachment to home and locality is much stronger than ours. We know that during the late war homesickness was a disease that many died from, and this is the case with almost all the Indians. On the other hand, I understand, in the country from which they came, many of the Nez Percés are indicted by the civil authorities, and if they went back would probably be hung. I understand that there are some fifteen of them in that fix.

By Mr. STEWART:

Q. Is that true of Chief Joseph himself?—A. I do not know; I cannot say; I simply heard that in a way and from an authority which compels me to believe that it is true.

By Mr. MCCREERY:

Q. The Modocs are afflicted with pulmonary diseases, are they not?—A. I do not know.

Mr. STEWART. I took particular note of them. They appeared to me to be suffering from malarial diseases.

The WITNESS. I know that the Pawnees who were out as scouts complained very bitterly.

The CHAIRMAN. The Pawnees lost thirty-three per cent. of their number in two years, I believe.

The WITNESS. There is only this trouble that I can see about the Red Cloud and Spotted Tail Agencies, and that is the fear of grasshoppers. They have periodical visits from these pests that are liable to destroy their crops, as they have at Fort Hall and also at Camp Brown for two or three or four successive years. The grasshoppers have cleaned out their crops pretty effectually. When I was at Fort Hall last summer they had about three hundred acres of beautiful wheat and they were fearful that the grasshoppers would visit them before it was reaped, but I see that their fears have not been realized this year. I have no doubt that were it not for the grasshoppers a part of these Indians would be self-sustaining in five years.

CONTACT WITH SOLDIERS NOT DETRIMENTAL TO INDIAN WOMEN.

By Mr. BOONE:

Q. It has been stated by some of the witnesses whom we have examined, that the proximity of the soldiers to the Indian agencies was

very detrimental to the morals of the Indian women. You have heard of it, no doubt. I would like to have you state whether that is true to a greater extent than it would be likely to be with the same number of men of any other pursuit or of any other class of citizens?—A. I think not. I think that a man is a man, the world over. You have got to have force there, and it has got to be in the shape of men.

Q. The fact of an Army officer being in the position of an agent does not necessitate an increase of the number of soldiers, does it?—A. No, sir; not in the least; in fact, I do not think that soldiers generally are as bad as so many civilians, because the latter are not under the same discipline.

GENERAL CROOK DOES NOT DESIRE THE TRANSFER.

Q. They have not so many liberties?—A. No, sir. I will say in reference to my speaking as plainly as I did about the transfer, that I hope it will not be made—I hope the transfer will not be made.

Q. For what reason?—A. Because I expect that they will want me to take some position or other in it, and I do not want it. I have had enough of the Indians.

Q. Is that the general idea; does it prevail among the Army officers?—A. Yes, sir. We would get no extra compensation for it—only additional responsibility. We do not want it. But at the same time there is a general feeling in the Army that there should be something done to improve the present system; but I do hope if it is done, for the credit of the Army and of good government, that they will not so tie it up with legislation as to prevent the Army making the Indian service as efficient as possible. I do hope that they will not put it in the hands of the retired officers of the Army, as I have seen it stated that they intend to do. The fact is, there are enough officers in the Army in the regular line to do these duties and get along with their military duties as well.

Q. You think that things ought to be left in the hands of the commanding officer?—A. Yes, sir.

Lieutenant LEE recalled.

By Mr. HOOKER:

Question. You spoke of a civil agent who preceded you, by the name of Howard.—Answer. Yes, sir.

Q. You spoke of his having drawn rations for eight or nine thousand Indians, when the census showed that there were only four or five thousand?—A. Yes, sir.

INDIANS OVERESTIMATED AS TO NUMBERS.

Q. Do you know whether that officer was ever punished by any civil proceeding under the government?—A. He was not. As I stated before, I believe the telegram came that he was dismissed from his position as agent.

Q. As agent where?—A. As agent at the Spotted Tail Agency; and then, afterward, he was appointed agent for another tribe.

Q. What tribe?—A. For the Poncas; but so many charges were made against him that the Senate would not confirm him, and he had to step out.

Q. These facts as to his misrepresentation of the number of the Indians and his drawing double the quantity of rations were made known to the department by you, were they?—A. They were reported. Howard was

not my immediate predecessor; three military officers intervened. The record shows that rations were drawn for nine thousand Indians, and the census taken by Lieutenant Foote showed that there were but four thousand five hundred Indians. I made Lieutenant Foote's census the basis for all my estimates, and I found in a year's time that it did not vary two hundred from the exact number.

Q. Who was Commissioner at the time Howard was reappointed agent, and what was the year?—A. It was in 1877 that he was reappointed. He was removed in 1876.

Brigadier-General CROOK recalled.

By Mr. MCCREERY:

Question. To what extent do you think the Indian wars may be ascribed to the mismanagement and frauds of the Indian agents and traders under the present management?—Answer. These, together with the bad faith of the government, I can safely say, ninety-nine hundredths. If you will investigate all these Indian troubles, you will find that there is something wrong of this nature at the bottom of all of them; something relating to the supplies, or else a tardy or broken faith on the part of the general government.

By the CHAIRMAN:

Q. You do not pretend to say that all these Indian troubles would be cured by turning the management of the Indians over to the military arm of the government, do you?—A. No, sir; I do not assert that. I merely state the facts as I believe them to be.

Maj. A. W. EVANS sworn and examined.

The CHAIRMAN. You have heard the questions which have been propounded to the other witnesses that have preceded you. If you have anything special to state in reference to the subject under consideration by this committee, we will be glad to receive it.

The WITNESS. I do not know that I can add to what has been said by others.

Question. You have had, then, no particular experience as Indian agent?—Answer. No, sir; I have never been an Indian agent.

Q. Have you ever been located near the Indians?—A. Yes, sir.

Q. Then you know something of them generally, do you not?—A. Yes, sir; I know something of them generally.

THE TRANSFER SHOULD BE MADE.

Q. Have you ever formed any opinion on this subject?—A. I think, undoubtedly, that it would be for the benefit of the Indians that the transfer should be made. I do not see why, if the same machinery that is now in use in the Army could be employed in the Interior Department, and the agents could have the same inducements that the officers of the Army have to conduct themselves properly, they could not succeed as well with the Indians as anybody else.

Q. In other words, proper treatment is what you deem necessary, from whatever source it comes?—A. I refer to this: If you put a civil agent in the same position as an Army officer, I do not see why he should not be just as honest and answer just as well for the position as an Army officer. The civil agent does not perhaps get the same consideration in his position, and they have not perhaps the same tenure of office. They have not perhaps the same elaborate machinery that is in use in the Army in conducting this thing. I do not know that it is practicable

in the Interior Department to use so elaborate a system, based as it is on an entirely different state of things.

GOOD MANAGEMENT NECESSARY WITH THE INDIANS.

Q. You, then, have pretty much the same opinion as the other gentlemen who have preceded you as to this question, namely, that good management is what is necessary in dealing with the question?—A. Yes, sir.

Q. It is the bad management that produces these difficulties?—A. Yes, sir; the bad management.

By Mr. HOOKER:

Q. I understand you to express this opinion: That, if the Interior Department had such a system of purchasing and distributing supplies that are appropriated by the government to the Indians, and the same system of accountability on the part of the men who make the purchases and who issue them, and the same system for the Commissariat and Quartermaster's Department, that you might then find men just as honest and as diligent as you could find in the War Department?—A. If you should pay the Indian agents just as well as the officers of the Army are paid, and their tenure of office were made as secure, that is, if you were to hold out the same inducements for the civilian to be honest and trustworthy, you would find them to be just as honest as the military. After all, it would seem that you have got to pay for honesty in this world. That is about my view of it. I mean, of course, to a certan extent, as human nature goes.

By Mr. BOONE:

Q. Are you acquainted with the Army?—A. I am an officer of the Army.

INDIANS CAN BE MADE SELF-SUSTAINING.

By the CHAIRMAN:

Q. From what you have observed of the Indians, what is your opinion of the chances of building them up, and bringing them up to the point of self-dependence and self-sustenance?—A. Ultimately, I suppose it can be done. There are a good many tribes that are already self-sustaining. Some of them we have found so, and others we have made so, I suppose. There is another point that struck me in the general course of the testimony, that is, the question of the division of the lands among the Indians in severalty. I think that it ought to be restricted to this, that the lines of the reserve should not be broken. Survey the reserve and let them have it, but do not permit them to sell the land. Allow white men once to come in and trade off their lands, and you will break them up in a little while, so that there would be nothing left in five years for them to sell. You would have to keep up the tribal relations so far as the reserve is concerned.

LANDS SHOULD BE INALIENABLE FOR A TIME.

Q. I think that the bill before Congress provides that the Indians shall not sell their lands for ten years?—A. Until they have become, in every respect, capable of taking care of themselves. I merely mention it because General Crook did not refer to it.

By Mr. HOOKER:

Q. That principle applies, of necessity, to the prevention of alienation by the Cherokees, Creeks, Chickasaws, Choctaws, and the civilized tribes

in the Indian Territory, does it not?—A. I think so; yes, sir. I understand that such attempts have been made recently, by certain people, to have the Indians enabled to part with their lands. It would result in their amalgamation with the other population or lead to their utter extinction.

Q. Would you advise, if anything of that kind should be done, that some long time should be given before they could transfer the lands themselves?—A. Yes, sir.

By Mr. STEWART:

Q. Would not one hundred years, in your opinion, be better than ten years?—A. Very likely it would.

By the CHAIRMAN:

Q. If you go into the hundred-year system, you may as well permit them to remain in the tribal relation, may you not?—A. As soon as they become thoroughly capable of taking care of themselves; then they may be permitted, I should say, to alienate their lands.

OMAHA INDIAN AGENCY, NEBRASKA,
October 16, 1878.

JACOB VORE, agent, affirmed and examined.

By the CHAIRMAN:

Question. What are your Indians doing in the way of agriculture?—Answer. Two years ago they broke about one hundred and seventy-five acres of ground; and one year ago they broke two hundred and eighty acres; and this year they have broken from four hundred and fifty to five hundred acres, in addition to what they had before—some twenty-two or twenty-three hundred acres. Every year they are increasing in this respect in that ratio. The Indians say, "We want to stay here and make this our home. We have made improvements and we want titles to our lands and we want to know that when we make improvements on our lands they are ours; and if we can have and keep them as our own, we will go to work and redouble our efforts to improve them." That is good reasoning, I think. The white man would reason in the same way. They do not want to work for other people.

Q. What number have you, of Omaha Indians, in your agency here?—A. There are about eleven hundred Omahas here; but it has been very sickly the last three months, and quite a number of our Indians have died, especially of the children. I do not think there are over ten hundred and seventy-five of them at present.

Q. What is the number of your neighboring tribe, in the Winnebago Agency, adjourning, you?—A. The agent there can tell you exactly.

By Mr. BOONE:

Q. We would like to have you answer that question if you will do so.—A. There ought to be, I think, about fourteen hundred of the Winnebagoes, but those Indians are scattered in Wisconsin, and over at Sioux City, and down through the State, going backward and forward very frequently. There ought to be some fourteen hundred of them; perhaps there are not over nine hundred of the Winnebagoes, all told, on the agency. If they were informed that there was to be a large annuity paid them, I suppose there would be in a short time fourteen hundred of them.

Q. How many acres are there in your reserve—I mean of the Omaha reserve?—A. About 193,000 acres.

Q. And only about eleven hundred Indians?—A. Yes, sir.

By Mr. HOOKER:

Q. Will you state the extent of the reserve?—A. It is about twenty-two miles east and west, and about thirteen or fourteen miles north and south; in that neighborhood.

By Mr. STEWART:

Q. What is the size of the Winnebago Agency—the area of the reservation?—A. I think, as well as I can recollect, that it is about 110,000 acres. It extends about as far west as the Omaha reserve, but is not so wide. I do not know the width. There is a jag in it that makes it in all about 110,000 acres.

Q. I think that that was purchased from the Omahas, was it not?—A. Yes, sir; originally, a few years ago, in order to induce the Wisconsin Winnebagoes to settle here. They had been brought down and sent back. They objected to staying here for want of timber, and the department purchased about twelve thousand acres from the Omahas. The best timber the Omahas have is along the river. They promised that if they were given the timber they would stay. They built themselves a number of good two-story houses. Some staid all winter, some did not.

By the CHAIRMAN:

Q. The Winnebagoes have not been here as long as the Omahas, have they?—A. They have been here longer.

Q. Not here?—A. In Wisconsin they have been longer.

Q. They were up in that wild country where savages were around them, and I think they did not learn much?—A. They are not as far advanced in civilization as the Omahas are.

Mr. STEWART. The Winnebagoes, if I understand it, came from Minnesota in the year 1855 or 1856.

The WITNESS. If I understand it, they went from Wisconsin to Minnesota, and after the massacre some of them went back to Wisconsin, and some of them came here—from Wisconsin to Minnesota, and from Minnesota here. They have not been here so long as the Omahas. There is not very much difference, however; the Omahas came here, I think, in 1856.

Mr. STEWART. Some of them left Minnesota in 1855, I believe.

The WITNESS. You will get more information concerning them, than I can give you, at their agency, a little farther on.

By the CHAIRMAN:

Q. You say that there are some twenty-odd hundred acres under cultivation?—A. Between twenty-two and twenty-three hundred acres; and about four hundred and fifty broken this year, for next year's operation.

AGRICULTURE AMONG THE INDIANS.

Q. Broken for what?—A. For wheat, corn, potatoes, and other vegetables. They have in this winter between ten and eleven hundred acres of wheat, and I estimate about a thousand acres of corn. The wheat will not be so good this year as it was last year. Almost up to the time of harvesting it looked as good as good could be; but it did not hold out so well. I estimate the crop of wheat at eighteen thousand bushels, as against twenty-four or twenty-five thousand bushels if it had filled up. I estimate the crop of corn at thirty-two thousand bushels this year as

against twenty-seven thousand bushels last year. There is about the same number of acres of land cultivated, but it is much better cultivated this year than last. Last year I estimated the crop of potatoes at five thousand bushels. This year I estimate it at six thousand bushels, and the other vegetables about the same as last year.

Q. Do you have any difficulty in taking care of the vegetables; do they attend to them promptly and properly?—A. Yes, sir.

EDUCATION OF THE OMAHAS.

Q. What is the number in attendance upon your schools here?—A. The highest number in attendance last winter was one hundred and ten at the two schools.

Q. That is what I mean—at your two schools.—A. Yes, sir; at the two schools. Last winter it was one hundred and ten, and I think this winter the number will be as large, although it depends a good deal upon how we are able to clothe them. They are not provided with clothing, and if they have not a sufficiency of clothing very few of them come to school, but if they are well provided for in that respect, they come; if not, they cannot come, because they suffer from the lack of it. It depends very much on that.

Q. You have a fund set apart by the government, do you not?—A. Yes, sir.

Q. Are your Indians making reasonable progress in the schools in the matter of learning?—A. I think they are.

INDIANS DESIRE TO HOLD PROPERTY IN SEVERALTY.

Q. I would like you, while you are on the stand, to state to us how these Indians feel and how you feel after the management you have had of them, on the subject of going farther in this matter of the ownership of the land in common. Would they prefer to have their lands divided up and owned in severalty and be permitted to hold their property like white people? What is your best judgment on this, and how do you think your Indians feel about it; what do you consider would be the best for their interests?—A. I think that all the intelligent ones who are doing well (some of them, of course, just as you will find among the whites, are shiftless); I think that the tribe, taken together, would desire most certainly and distinctly to have their lands set apart to them and have deeds to them issued and given into their possession, so that they can know that they are their own lands; but I should say that they ought to be inalienable for twenty-one years, so as to give them an opportunity to improve them, and to understand how to manage their affairs, before they are wrested from them by those who are sharper than they are. I will say that that is their feeling so far as I have had any expression of it from them. They say: "We want to have our lands so that we can know that they are ours, and then we can go to work to improve them; but so long as they are held by us as they now are we cannot feel any encouragement to improve them and increase their value as we otherwise would."

Q. You have learned a good deal, no doubt, about their disposition to acquire property, &c.; do they seem fully or at all to appreciate the advantages that would result from well directed labor on their lands; that is, if a man works harder and more faithfully than others, does he feel that he is entitled to and will reap greater results to himself?—A. Yes, sir; very few of them are so wanting in intelligence as not to understand that. Very often they say: "We know that we have to work for a living; the time for hunting has passed; we have got to live now out

of the ground, and those who work hardest and best will get the most out of the ground." We can all see that there is among them an inclination to get the largest crops and the best prices, the same as any other people would.

INDIAN LANDS SHOULD BE INALIENABLE FOR A TIME.

By Mr. HOOKER:

Q. Upon the matter you were speaking of a moment ago—the holding of lands in severalty—do you think, if the lands were divided up and held in severalty, that the improvident ones would be likely soon to lose their lands?—A. Not if they were rendered inalienable for a certain number of years.

Q. They would not lose them after that period, would they?—A. Some of them would, probably, just as white people would, and for the same reasons.

Q. What do you think of the probability of the territory of the reserve being occupied in time by white people? Do you not think that that would be the eventual result of having their lands divided up into severalty, with the right to alienate?—A. Immediately?

Q. After the expiration, say, of twenty-one years.—A. No, sir; I think that with twenty-one years of proper training and instruction a large proportion of our Indians would be just as well qualified for the care of the lands as a large proportion of white people would be. They would have their lands for their homes, and they love their homes. No class of people, perhaps, would be less disposed to squander their homes than a large majority of the Indians.

Q. As to the balance of them—they would lose their lands?—A. I think as to that, that they would be the same as white people; no worse, some would lose their homes, some would not.

Q. And you think the greater majority of them would be disposed to retain their homes?—A. A very large majority, because the others would want to continue on the land. They are rather tribal in their feelings, and nearly all would want to continue with their friends, and would do so.

Q. In their tribal relations?—A. Yes, sir; and whether they keep these up or not, they feel an affinity for these relations and traditions, and would want to stay on the lands that they had improved, and that they called and held as their own.

Q. No one is admitted to the tribal relations except those that intermarry, I judge?—A. No, sir.

Q. What proportion are intermarrying?—A. Perhaps four or five.

By the CHAIRMAN:

Q. There have been no recent intermarriages, have there?—A. I remember none recently.

By Mr. HOOKER:

Q. What is the character of the whites who intermarry with the Indians; are they of the industrious laboring class?—A. Some of them are, and others are not so much so. As a general thing they are called "squaw-men"; some of them are rather industrious, but, as a general thing, I do not think they are as industrious and thrifty as the Indians.

HOW LANDS ARE HELD BY THE OMAHAS.

Q. You were speaking of having such a proportion of land in wheat, and such a proportion in corn; how do they now cultivate—do they

hold their lands in common, or is not each family's boundary designated, and does not each family hold its land in severalty?—A. Certainly, most of them have certificates for their land.

Q. Certificates from whom?—A. From the department.

Q. They hold them, then, practically in severalty as it is, so that they are not subject to be intruded upon by other Indians?—A. Not at all subject to intrusion.

By Mr. McCREERY:

Q. How much land would you assign to each Indian?—A. I would assign to each Indian in proportion to the number of his family.

Q. Would you divide up the territory of the reserve among them, or would you give them so much per head and sell the balance to the whites?—A. I would give them so much per head—just as much as they could judiciously and properly work, and the balance I would reserve for them, or for such use as circumstances might suggest.

Q. If the lands are to be divided, would it not be proper to make an equal division of their own lands?—A. So far as it should be necessary to do so; the balance would then be held in reserve for their offspring, unless they should afterwards conclude to sell. If a majority of the tribe should conclude that they had enough without fifty thousand acres, and concluded to sell, I should say that they might be allowed to sell.

EDUCATION AMONG THE OMAHAS.

By Mr. BOONE:

Q. How many schools have you?—A. Two.

Q. By whom are they taught, by native or by white teachers?—A. By white teachers, with the exception of this girl here (Miss Susette La Flesche); she is a teacher.

Q. Has this Indian lady charge of a school here?—A. No, sir; a white man has charge of the school.

Q. She is then an assistant teacher?—A. Yes, sir; she was last winter. An Indian woman had charge last year and she was assistant.

Q. She is quite competent as a teacher?—A. Yes, sir.

Q. Was she educated in the East?—A. Yes, sir; in New Jersey.

Q. Who have a right, under your present regulations, to attend school here?—A. All the Indians of the tribe.

Q. Any distinction as to age?—A. No. I would not make any such distinction.

Q. What is the regulation now?—A. The school is for all who will go, because the Indians are not in the habit of sending their children after they grow up a little. A girl of thirteen or fourteen years of age thinks she is too big to go to school, and they go without an education. The boys of fifteen and sixteen think the same. The school age is practically limited, therefore, to the age from fifteen to sixteen.

Q. Are they taught the English language?—A. Altogether, except the younger ones. This assistant teacher thinks that they cannot understand English until she will first give them words. For instance, she will give them a word and state what it is called in English and in Omaha, and then she will have them give it to her in English.

Q. The object is to teach them English, I suppose?—A. Yes, sir. I instruct the teachers and earnestly admonish them not to allow the scholars in school to use the Omaha language, except so far as is necessary to teach them the English by means of it. Outside of the schools, of course, they can use whatever language they please, but in the schools it is made obligatory upon them to use the English whenever they can.

Q. Do the parents agree to that?—A. They are anxious that it should be so. One or two families objected to the teachers instructing their children any other way. They said, "We do not want you to teach our children Omaha; we want English."

Q. Are the schools progressing?—A. I think they are; quite as much so as could be expected. I do not see but the progress, taking all things together, having to learn the language as they go along, is as good as could be expected, and as rapid and satisfactory as it would be among white children of the same age under more favorable circumstances.

CAPACITY OF THE INDIANS TO ACQUIRE AN EDUCATION.

Q. Their capacity for learning and their progress are, you think, about the same as white people?—A. About the same as the rest of mankind.

Q. Do they seem anxious to learn after getting in the school?—A. Quite as much so as white children; I do not know but more so, because they do not know so much, and have not so much to divert their minds from their studies.

Q. Have they any church?—A. We have one mission.

Q. That is a Presbyterian mission, is it not?—A. Yes, sir.

Q. You yourself are a member of the Society of Friends, I understand?—A. Yes, sir.

Q. Were you designated for the position as agent here because of your connection with the Society of Friends, under the rules in operation in the department?—A. I was nominated for this position by the Indiana yearly meeting of Friends.

LION, chief of the Omahas, examined by means of an interpreter.

CHARLES P. MORGAN, interpreter, sworn.

By the CHAIRMAN:

Question. How long have you lived here?

Chief LION. I don't want to answer your questions before the rest of our chiefs are here.

Q. We are going on to other places very soon. If you want to answer my questions, do so; if not, we will go on.—A. I don't want to answer, because I want the other chiefs to be here.

Q. Do you consent to answer my questions?—A. Not now.

Q. Are you satisfied with the way things are managed at present among you, or would you rather have officers of the Army to act as your agent and do your business here for you?—A. I don't want to answer until the rest of my friends come.

Q. Would you prefer to have your property, your land, in severalty; that is, to have each one of your tribe own so much land for himself, or do you prefer to hold it in common?—A. I will not answer.

Q. We are here as your friends, and we want to carry away with us a report to the Great Father at Washington. We want to say all we can in your favor—not against you. If you want to say anything to us, now is the time to say it. If you want us to bear any message to the President we will do so, but we cannot wait much longer.

Mr. HOOKER. I would suggest to the commission, before the chiefs are interrogated here, that it would be well to explain to these Indians, if they can understand it, that this is the joint committee of the two houses of Congress that make all the laws in reference to their tribes; that the Senate confirms all the treaties that are made with them, or that may be made, and that this commission is invested with an authority superior to any other authority by which they can have a con-

ference or hold a council with the government; that we are here under this authority for the purpose of looking into their condition; and if they want to say anything to the President or to the people, this commission is empowered to hear it and convey it to them.

By the CHAIRMAN:

Q. We have visited the five tribes of the Indian Territory, and the Quapaws, Nez Percés, and Modocs, and they have all talked to us freely. This is the first place where the Indians have refused to talk with us.

Chief LION. There is one other chief I desire should be present before I talk.

Q. You heard what General Hooker said. We are delegated with authority by the Congress of the United States?—A. Yes, sir; I understand that.

Q. If you have any complaints to make, or grievances to state, or any message to send to the Great Father at Washington, we will bear them to him.

Mr. HOOKER (to the interpreter). Explain that to the chief who has just entered the room—Chief Imbahomba.

Chief IMBAHOMBA. I do not want to say anything until the rest of the chiefs are here. A good many others will be here soon, and we want to wait for them.

The CHAIRMAN. They must know that we are here as a peace commission, favorable to their interests, and are not here for the purpose of selling them out or of imposing upon them in any way whatever.

(HENRY FONTELLE was here sworn as interpreter, taking the place of Mr. Morgan, who was indisposed).

The CHAIRMAN. Somebody said to me that these Indians were fearful that we were here for the purpose of moving them or getting them to go somewhere else. There is nothing of the kind in view. If they will tell us that they would prefer military men, or if they are satisfied as they are, with the gentleman who is agent, we will tell the President just what they say.

Mr. HOOKER (to the interpreter). State that this commission is sent here by the legislative or law-making department of the government, and that it is superior to the President or the department or anybody else, and we are here for the purpose of ascertaining facts with reference to their improvement in agriculture, civilization, schools, &c., and that we have nothing to do with depriving them of their lands; they own them as their own, and they alone have a right to dispose of them.

OMAHAS OBJECT TO THE TRANSFER.

The INTERPRETER. I interpreted all that Senator Saunders and General Hooker have said in regard to the military. Imbahomba says he is against being transferred over to the military department. They do not want the military department, he says.

By the CHAIRMAN:

Q. Does he think that the military, if they come here, would be empowered to fight them and to act as military men ordinarily do without orders from Washington, or does he understand that they would simply be acting in the capacity of agent, and that no war could be made by them unless it was ordered by the department? Do they understand that?

The INTERPRETER. I will ascertain.

(Chiefs "White Horse" and "Fire Chief" enter the room.)

Mr. HOOKER (to the interpreter). Are they all here now?

The INTERPRETER. Not all the chiefs, but I guess there are enough?

Q. They will not refuse further to speak, will they?—A. I think not.

Q. Ask them whether they will longer refuse to confer with us—to answer our questions?

The INTERPRETER. Fire Chief says that he would rather all the chiefs were present, and that it is asking rather a hard thing to have one of them answer when the others are not here to speak for themselves.

The CHAIRMAN. Well, let each one answer for himself.

Mr. MCCREERY. Inform them that we have come to gain information and to learn their individual opinions.

The CHAIRMAN. Tell them that wherever we have been among the Indians each Indian answered for himself.

Mr. VORE, the agent. Tell the Indians that these gentlemen do not intend to take any advantage of them in any way; that they have come here as their friends and want to gain all the information they can, but do not intend to take any advantage of them whatever.

The INTERPRETER. They are ready to answer the questions you may put to them. Inbahomba will first answer.

IMBAHOMBA, chief of the Omahas, examined by means of an interpreter.

By the CHAIRMAN:

Question. Are you satisfied with the present management of Indian affairs at your agency here?

IMBAHOMBA. I am well enough pleased with the way we are getting along now. We are well satisfied, and have decided that our only way of living, and of getting along, and supporting ourselves, and trying to be a people, is to till the ground, as it was the wish of the government that we should do.

Q. That is, as I understand you, you have made up your minds that inasmuch as it was the wish of the government that you should till the ground, you were satisfied to live in this way. Do you want the government to do anything more? Are you willing to divide up your land among your Indians, or do you want to hold it as you do now?—A. We have always held our lands in common until lately, and since our lands have been allotted to us in severalty each one of us works upon his farm, and in this way we raise what we want to and what we can, and we feel as though we were getting along pretty well.

Q. Am I to infer from that that you would advise or prefer that the property be divided up so that each one could own it in severalty?

The INTERPRETER. I was trying to explain the difference between the certificates we have now and the fee-simple.

Mr. HOOKER (to the interpreter). Please interpret to us literally each reply that he makes.

IMBAHOMBA. Of course I want to live upon the land. I love to live here. I do not want to leave it; and if I live upon it, I want the paper that will give me a full title to it as my own.

By Mr. HOOKER:

Q. Are you satisfied with the paper right which you have to the land which you now cultivate, and which cannot be interfered with by any Indians or white people? You said that you wanted some claim to your land. Are you satisfied with the certificate that you are now working under, which cannot be interfered with by anybody?

IMBAHOMBA. The land which I live upon I want to live upon as my

own. I live upon the land, and I want it for a home for myself and my family always, and I do not wish, nor do I propose, that any other one, whether Indian or white man, shall come along and drive me off.

Q. How much land do you now claim and occupy?—A. One hundred and sixty acres.

Q. What do you propose, or what do your people propose, to do with the remainder of the reserve? Would you be willing to have the whole of the reserve divided in severalty between them, or only a portion of it, and what disposition do you propose to make of the balance? Don't you think it would be against the interests of the Indians to allow the right to sell? Don't you think that under that right to sell the white man would probably after awhile take possession of your lands; that is, that the white man would purchase the land from the improvident Indians among you?—A. As to letting our lands go, or selling them, I think it ought not to be allowed. If any of our people want anything—if they want money, they can go to work and get it out of the ground by working for it. I think each head of a family ought to hold one hundred and sixty acres as they are holding it now, and minors, whether grown or not, ought to be entitled to forty acres apiece.

Q. Do you mean to say that you think the reservation, to the extent which you have mentioned, ought to be given out to each individual family, or heads of families, in proportion to their children, with a right to dispose of it if they want to; or do you mean that it should be divided up as now, and simply secured to you as you are now cultivating it?—A. If it was not alienable for twenty-five years, it would be better, I think.

By the CHAIRMAN:

Q. What would you do with the balance of the land? Do you want that kept unimproved, or sold to the whites, and the proceeds invested for your benefit?

The INTERPRETER. Fire Chief says he does not understand you.

FIRE CHIEF, chief of the Omahas, examined.

FIRE CHIEF. I did not understand your last question.

(The interpreter repeats the question.)

FIRE CHIEF. I think the surplus land ought still to be held for us and not sold.

By the CHAIRMAN:

Question. You do not answer the question fully. Would you prefer that the Indians should buy it, or that the whites should buy it?—Answer. I would prefer that it should not be bought either by white men or Indians. There are several years' annuities yet due us. We would prefer to let it lie still until our installments are gone—until we have no more annuities due us from the government.

By Mr. HOOKER:

Q. Have all the annuities and supplies due you under the treaty stipulations been delivered to you?—A. When we sold out our country here we drew our annuities in money; but lately we have not drawn any money, and from what you paid to us we cannot tell exactly. I would rather you would ask our agent that question.

Question (to the agent). How are the dues paid to the Indians by the government?

The AGENT. They get no annuity per capita.

Mr. HOOKER. What does the annuity amount to at present?

The AGENT. Twenty thousand dollars a year, I believe. It is paid mostly to them in agricultural implements, and generally paid to heads of families.

The INTERPRETER. The words "per capita" I cannot exactly interpret.

Mr. HOOKER. It means per head—what amount is paid per head—and is that amount paid regularly? I want his statement on that.

FIRE CHIEF. At the beginning we received $25 per capita; afterward it decreased until it came down to $9 per head; that was the last we received—$9 per capita in money.

By Mr. HOOKER:

Q. When was that payment made?—A. I do not remember exactly; but it was paid during the administration of Mr. Gillingham, the agent.

By the CHAIRMAN:

Q. Have you not received machinery and other things instead of money?—A. As to agricultural implements, the first installment we received was 100 wagons; that is, 99 wagons and one light spring-wagon, for the use of the agency, and also plows, shovels, hoes, &c., which were divided out to heads of families and those living upon the lands.

Q. Those were received in lieu of the money annuities?—A. Yes, sir.

By Mr. HOOKER:

Q. When was the last annuity paid you in money?

IMBAHOMBA. It was two years ago since we received any money—it has been over two years since we received any money.

By the CHAIRMAN:

Q. Are you satisfied to receive it in implements for working the land, implements of husbandry, &c.? Are you as well satisfied with that as you would be with the cash?

IMBAMOMBA. We are satisfied to receive agricultural implements so far as we need them; but we would be better satisfied and contented if we could receive half or a part of the annuity in money.

By Mr. HOOKER:

Q. What is the total annuity paid by the government to you per year?

FIRE CHIEF. There are twenty thousand dollars a year due us from the government. I suppose we get that amount in implements, machinery, tools, &c., to work with.

Q. Then you would prefer to have half of it in money, would you?—A. Yes, sir.

By Mr. BOONE:

Q. Have you any complaint to make of the manner in which the government is fulfilling her treaty obligations with your Indians? These are matters of treaty, you understand?—A. At the commencement, after we sold our country out here, these things were paid to us as they were promised, but the more the time went on the less regular they became, and it was with difficulty we got all that was due us from the government.

By Mr. HOOKER:

Q. Do you prefer to have civil agents, as you have now, appointed by the Interior Department, or would you prefer officers of the Army to be your agents?—A. My friends, I wish to live in quiet and peace. I wish to live happy and have all my people happy. I cannot tell myself as regards the civil agent or the military agent, but I wish to leave this to

the well-thinking men that guard over us, and our Great Father. I have nothing to say against the soldiers of the country, but I do prefer to have the civil authorities appoint our agents, especially Christian denominations, and we would probably prefer some to others, and if our Great Father would allow us to take our choice we would rather do so.

The INTERPRETER. When Fire Chief says he would probably prefer some to others, he refers to the Christian denominations.

The CHAIRMAN. So far as the government is concerned, we desire to do the best we can, so long as you are peaceable and so long as we know that your people are peaceful. We want to treat you as citizens, and to do by you as we do by white people, and we want you to feel friendly toward us as we do toward you, and we are here now to ascertain what is best for your interests, and what can be done to better your condition. If you have nothing further to say, we will bid you good-by.

WINNEBAGO INDIAN AGENCY,
Nebraska, October 16, 1878.

HOWARD WHITE sworn and examined.

By the CHAIRMAN:

Question. How long have you been here as agent?—Answer. About eight years altogether. I came here ten years ago, but was away two years.

Q. What number of Indians have you in your agency?—A. About fourteen hundred and fifty here at present.

Q. The main business of this committee with this tribe and with all the tribes, in fact, is to ascertain their opinion on the subject of the transfer of the Indian Bureau from the Interior to the War Department. We would like to get from you such information as you can impart as to the progress which has been made by these Indians, and whether they are becoming self-sustaining as they progress. I understand that these Indians here have their property in their own name?—A. They have.

Q. Are they pleased with that?—A. They are, I believe.

Q. So that each one works for himself and owns his own property separately from the others?—A. Yes, sir; he does.

Q. Are they satisfied with this state of things, so far as you know?—A. So far as I know, they are very well satisfied with the management. They have eighty acres to each head of a family.

Q. That, I take it, does not take up the whole reservation?—A. No, sir; only about one-third of it.

Q. What is their view, as you have ascertained it, in regard to the balance of the land in their reservation? What do they want done with it? Are they willing to have it sold and the money put to their use, or would they prefer to have it remain as it is?—A. That is a question I never heard them discuss. I do not know their opinion upon that point.

Q. That is one of the matters we have tried to ascertain from the various Indian tribes we have visited, whether or not, where there is more land than they wish to have divided, they would prefer to have it sold or not. In some places they would be willing to sell it to Indians, as they told us in the Indian Territory. Would these people prefer to have their tribes brought in here, or the whites to be their neighbors?—A. I do not know that I can answer that.

EDUCATION OF THE WINNEBAGOES.

Q. You have schools here?—A. Yes, sir; we have schools.

Q. You are teaching English in them altogether, are you not?—A. Yes, sir; entirely. We have one boarding-school.

Q. They are successful schools, are they, so far as you are able to testify in the matter?—A. Very successful.

Q. Do the scholars incline, after they have learned the English language, to make use of it and to utilize the advantages that education brings them? We have heard that in some places, after they have learned to talk our language, they are loath to make it known to others?—A. They are slow about doing it.

Q. Those who are not educated and who are so old that they do not want to be educated, have they a prejudice against education?—A. The parents, do you refer to?

Q. Yes, sir.—A. I do not think that they have any prejudice against it, but they do not appreciate it, and they are slow at sending their children to the schools for this reason principally.

Q. Are your people contented here and do they want to remain, or are they willing or anxious to sell out and move to any other country?—A. So far as I know, they are all satisfied and anxious to stay.

By Mr. HOOKER:

Q. What is the extent of the reservation of the Winnebagoes?—A. It contains about one hundred and ten thousand acres.

Q. Give it in miles—length and breadth.—A. It is twenty-two miles long and six miles wide half-way back from the river, and eight miles the balance of the way—an average of seven miles in width.

Q. How does the head of each family hold property?—A. By patents, issued from the Land Office by the government.

Q. To each one by name?—A. Each head of a family.

Q. Eighty acres to each?—A. Yes, sir.

Q. You say that embraces only about one-third of the reservation?—A. Yes, sir.

Q. How is the balance held; in common?—A. Yes, sir, in common, by the tribe.

Q. You say you have been here eight or ten years?—A. Yes, sir; about eight years.

ANNUITIES PAID TO THE WINNEBAGOES.

Q. How does the government pay the annuities to your Indians?—A. They receive but a small amount in cash per head. Last year it was three dollars.

Q. Three dollars per head?—A. Yes, sir, in cash, and four or five thousand dollars' worth of annuity goods.

Q. By whom are these goods purchased?—A. By the Indian Office at Washington.

Q. And furnished by contract?—A. I suppose they are; I receive them here.

Q. How are they paid for; out of the Indians' fund?—A. They are paid for out of the tribal fund, I suppose.

Q. How are they dealt out to the Indians?—A. I do that to the heads of families.

Q. How do you receipt for them?—A. To the railroad company.

Q. You receipt to the railroad company for them?—A. Yes, sir.

Q. What I want to get at is, under what contract, and by what contractors, are these supplies furnished; who are the men who contract to supply these Indians?—A. The Commissioner of Indian Affairs.

Q. He makes the contracts with the parties?—A. Yes, sir.

Q. These contractors furnish these goods to you, and you issue them to the Indians?—A. So much per capita is issued to the heads of families.

Q. What proportion of the annuities is paid in money?—A. It differs different years. These Indians have money which is held in trust for them by the government.

Q. To what amount?—A. About eight hundred thousand dollars now; it was a million dollars some time ago.

Q. How has it become less than a while ago?—A. These school-houses were built out of this fund, and some of the dwelling-houses.

Q. These houses were built out of the principal?—A. Yes, sir.

Q. They are half brick and half wood, are they not?—A. Yes, sir; I believe so, most of them.

Q. Are they occupied now?—A. Most of them are—those toward the Omaha Agency are not occupied.

Q. We noticed a good many, as we came along on our way here, that were unoccupied.—A. Most of them, nearly all of them, are occupied.

Q. They have lately been occupied by Winnebagoes, have they not?—A. Some of them are very little occupied. They were built for the Wisconsin branch of the tribe, who have returned.

Q. Have returned to Wisconsin?—A. Yes, sir.

Q. You say that the principal of the fund was taken to construct these houses?—A. Yes, sir; a part of the principal.

Q. Which reduced it from a million dollars to eight hundred thousand dollars?—A. Yes, sir; but some of it also was used to remove the Wisconsins here.

INTEREST ON INDIAN TRUST-FUND.

Q. How is the interest paid?—A. It is appropriated annually.

Q. At the rate of five per cent.?—A. Yes, sir.

Q. What proportion of that appropriation in money to pay the interest of this trust fund which the government holds is paid in money per capita to the Indians, and what proportion otherwise?—A. There is no fixed sum paid in money. We have been in the habit of paying only about three dollars a head in money, which would make about four to five thousand dollars a year in money.

Q. What is the entire amount of their annuity?—A. This branch have been receiving about twenty-eight thousand dollars; the balance of the interest is set apart for the Wisconsin Winnebagoes.

Q. The entire tribe would receive about forty thousand dollars a year?—A. About sixteen thousand dollars is set apart for the Wisconsins.

Q. The balance of the forty thousand dollars is set apart for and paid to this tribe?—A. Yes, sir.

Q. And paid at the rate of three dollars per head?—A. That is all they get in cash; the balance goes toward paying the employé force.

Q. Of the agency?—A. Yes, sir.

Q. And to anything else?—A. Yes, sir; to the purchasing of supplies for the shops, and paying for the annuity goods; things received, such as agricultural implements, &c.

Q. These annuity goods are furnished by contractors with the department at Washington?—A. Yes, sir.

Q. You receive them here?—A. Yes, sir; they are bought by the government at Washington.

Q. Who passes upon the purchases, as to their character and quality?—A. A general council of the Indians is called, and I ask them what they need, and then I fix up an estimate.

Q. When the goods are brought here, who receives them and becomes responsible for the quantity and quality of the goods; to see that they carry out the contract as made with the government at Washington; who passes upon the goods with that in view?—A. No one, after they come into my hands; I have no samples to judge by. They are supposed to have been inspected before they reach my hands. I have no samples sent to me to guide me, or by which I may know whether the goods come up to the contract or not.

Q. You receive them from the contractor?—A. Yes, sir.

Q. And you say about twenty-six thousand dollars are paid to the Winnebagoes—partly in cash and partly in supplies?—A. Supplies and cash, and pay of the employés.

INDIAN EMPLOYÉS AT THE AGENCIES.

Q. To what employés do you refer?—A. We have a farmer, a miller, a physician, all white men; and the balance of the employés, consisting of a blacksmith, two shoemakers, a carpenter, and an engineer, are Indians.

Q. An engineer to run the mills?—A. Yes, sir; a saw-mill and grist-mill.

Q. These are paid out of the fund belonging to the Indians?—A. Yes, sir; out of the trust fund; the interest on it.

Q. What is the duty of the farmer?—A. To see that the implements are properly distributed among the Indians, and properly taken care of, and to instruct them in agriculture generally.

Q. And the miller attends to the mill?—A. Yes, sir.

Q. And the blacksmith does the blacksmithing necessarily?—A. Yes, sir.

Q. And this is all done by the payment of so much to the farmer and so much to the blacksmith and so much to the miller, &c.?—A. Yes, sir; a fixed salary per year.

Q. No charges are made for repairs?—A. No, sir.

Q. Any charges made against the Indians at all for this work?—A. No, sir.

Q. Who is the trader for this post?—A. Daniel S. White, jr.

Q. Have you only one trader here?—A. Only one here.

Q. Who licensed him?—A. The Indian Commissioner.

Q. At Washington?—A. Yes, sir; another one has been licensed, but he has not appeared yet.

Q. What is the Christian denomination at this agency?—A. The Friends—Quakers.

GOVERNMENT OF THE WINNEBAGOES.

By Mr. McCREERY:

Q. Do the Winnebagoes preserve, or have they abandoned, their tribal relations?—A. It is pretty much abandoned. The hereditary chieftainship is abandoned. They elect their chiefs from among themselves annually. All members of the tribe over twenty-one years old are eligible. They hold their election in the latter part of March each year. Twelve chiefs are elected to serve one year.

Q. Have the chiefs any power?—A. Yes, sir; they have considerable power.

Q. More influence than power, is it not?—A. I suppose so. They try all cases that come up for adjudication.

Q. You have no courts?—A. We have the chiefs.

Q. You have no courts established by law?—A. None at all.

Q. What do you think would be the effect of establishing a court for the tribe?—A. We need something of the kind.

Q. You think it would be beneficial?—A. I do, sir.

Q. How many school have you on the reserve?—A. We have only two in session now.

Q. Does that include the high school?—A. It includes the boarding-school.

Q. What other school have you?—A. One day-school.

Q. Who are entitled to go to school under your regulations?—A. Any of the younger children.

Q. Not confined to any particular age?—A. No, sir; we have some difficulty in filling the schools at times. All are counted as children under the age of eighteen.

SCHOOL ATTENDANCE.

Q. What is the average number of pupils attending your schools?—A. We have now in attendance about seventy. I think it will average more than that generally.

Q. How does that average compare with the average attendance a few years back, say four, or five, or six years?—A. It was not so many. The boarding-school has only been established three or four years. Most of them attend there.

Q. You think there is some increase in the attendance on the school?—A. There has been.

Q. Who teaches in your schools—whites or natives?—A. White people.

Q. You have no native teachers?—A. We have none now.

Q. How many attend upon the high school here?—A. We just opened it about a month ago.

Q. It is a new enterprise?—A. It was opened before, and closed on account of the funds not being applicable. We hope to increase the number in attendance very soon to about seventy-five. We have now fifty-eight, I think, at the school.

Q. Does it seem to be in a prosperous condition?—A. It seems to be doing a very good work.

Q. How do these Winnebagoes look upon the question of education—do they generally desire it?—A. They seem indifferent about it.

Q. Rather indifferent?—A. Yes, sir; rather indifferent. They don't appreciate its advantages to them.

Q. Are there any exertions put forward to increase their interest in it?—A. Yes, sir. I talk with them about the advantages of it, and urge them to send their children.

Q. Why do they not desire their children to be educated—what seems to be the inpediment in the way?—A. I do not think that they appreciate the advantages of an education.

Q. Do those who go to school seem to be fond of it?—A. The children do; yes, sir.

Q. Do they seem to be encouraged as they progress?—A. I think they do. They seem to be.

Q. You have been here about eight years. During those eight years, in their agricultural and educational enterprises has there been, in your opinion, advancement?—A. There certainly has. When I came here, ten years ago, they were fed weekly with beef and flour, costing from twenty-five to thirty thousand dollars a year. At that time they received all the interest on their trust fund, amounting to some fifty thousand dollars a year. Most of it was paid to them in rations. That has entirely ceased.

INDUSTRY OF THE WINNEBAGOES.

Q. They are not now paid in rations?—A. No, sir; during the last year they raised their own living.

Q. Do they seem to be fond of agricultural pursuits; those that have gone into it?—A. Most of them do take great interest in farming. Some of them are very industrious and successful, and have large farms.

Q. How do they like stock-raising?—A. They do not seem to take to it.

THE LAWS SHOULD BE EXTENDED OVER THE INDIANS.

Q. You stated that you thought the establishing of courts of law in the reserve would be a good thing—beneficial to the Indians and the government; what do the Indians themselves think about that?—A. I believe that they are of the same opinion. They need some means for the administration of justice here that are more effective than anything they are able to provide under the present arrangement.

By the CHAIRMAN:

Q. As to the selection of these chiefs who you say administer justice, are they selected because of their prowess, their acts of bravery in the past, or by reason of their qualifications to govern, as they think, or their force of character and faculty of commanding others?—A. They select the most popular of their number.

Q. Some of this popularity grows out of their exploits in the field, does it not?—A. I do not think that that has any influence now.

Q. As to your church organization, are there any missions here established by other denominations than the Friends?—A. None.

Q. Is there any clamor on the part of the Indians for some other denominations to come in? What is the feeling on that subject?—A. I have not heard anything about it.

Q. No complaint?—A. No complaint.

By Mr. MCCREERY:

Q. Do courts of the chiefs take jurisdiction in murder cases?—A. Yes, sir; in all cases. They have a code of laws to go by.

By Mr. HOOKER:

Q. A printed code?—A. Yes, sir.

By the CHAIRMAN:

Q. Printed in English?—A. Yes, sir; their language is not written.

Q. Have any of these Indians made a profession of the law?—A. No, sir.

Q. The chiefs manage that part?—A. Yes, sir; in connection with the agent.

ALECK ST. CYR, chief of the Winnebagoes, sworn and examined.

By the CHAIRMAN:

Question. How long have you been here?—Answer. I was raised with the tribe.

Q. How long have you been in this State?—A. Thirteen or fourteen years.

INDIANS DESIRE TO BECOME CITIZENS.

Q. We would like to know whether your people are satisfied with the present management of your affairs by the civil department, or whether you would prefer that the military should act as agents; how do your

people feel on this subject? The question has been raised whether it would not be better to have the annuities paid, and the purchases made, and the general management of your affairs turned over into the hands of military men, instead of permitting it to remain in the charge of the civil authorities as at present; how do you and your people feel upon the subject?—A. I have not much to say, but will tell my opinion. My opinion is, that I would like to see that we all come to be citizens, and have our lands patented to us, and then we could get along without agents or anybody else.

Q. From this time on, do you think you could get along without agents?—A. Yes, sir.

Q. Then you don't care to have the management of affairs placed in either the civil or military hands?—A. I do not care for either one or the other. We want to have it just the way I am talking to you.

Q. Suppose the government should decide to place the management under the control of one of the departments for the time being, which one would you prefer?—A. I cannot tell you.

A. You have no choice as to that?—A. No, sir.

Q. You say you would like to have every man own his own land, the same as white people?—A. Yes, sir.

Q. And the law—you say you would like to have the laws extended over you the same as white people?—A. Yes, sir.

Q. And punished for offenses the same as they do among the whites?—A. Yes, sir.

Q. If I understand you, you are willing and ready for that, so far as you are concerned, and I suppose you give in your opinion what you think is best for your people?—A. Yes, sir.

Q. And adopt what we call the civil code and civil habits of the white people in full?—A. Yes, sir.

EDUCATION OF THE INDIANS.

Q. What is the reason that there are not more than seventy in attendance on your schools? You have several hundred here that could attend school, have you not?—A. The reason why our children do not go to school is, because some of the folks do not know, and some think that the children when they go to school have to go off in the winter-time—our Indians have to go off in the winter-time—and we have police here who go after the children and send them to school every day, and sometimes they want to take them and send them to school, and scare them that way.

Q. Your own people do not encourage them very much in going, do they; they have to get their encouragement from others; the example set them by white people; is that the idea?—A. Yes, sir.

Q. Has there been any increase in the desire to go to school within the past two years?—A. Yes, sir.

Q. You are disposed to let the children show the advantages of their schooling, are you not? I have heard that in many cases the children would not use the English language after they had acquired it in their schools?—A. Yes, sir; they are proud of it.

Q. How do your people stand on the religious question? Are your people disposed to attend churches as the whites or are they indifferent?—A. The great trouble is the government has never given us any minister. If they had given us any kind of a minister, probably we would all go into it; the probability would be better for us.

Q. Your people are not willing to establish your own churches as the whites do and invite ministers to preach for you, are they?—A. No, sir.

Q. There has been but little said or done on this subject?—A. Yes, sir; but little on that subject.

HENRY RICE, examined by means of an interpreter.
JOSEPH AMELL, interpreter, sworn.

By the CHAIRMAN:

Question. Are you satisfied with the present management of your affairs, as conducted by the Interior Department, or would you prefer to be turned over to the War Department?—Answer. I do not want to be turned over to the military department.

Q. State your objections. Do you know that the military, if called upon, would simply act in the capacity of agents, as these other men do, or do you suppose that the military would have the authority to punish the Indians more than the civil department now does?—A. We had a military officer for this tribe a long while ago, and he abused our tribe; we did not like him.

INDIANS DESIRE TO HOLD LAND IN SEVERALTY.

Q. Are you pleased with the plan of holding property in severalty and dividing it out like the white people do?—A. That is what I wish all the time.

Q. You think, then, that so far as your people are concerned, they are willing to take upon themselves all the responsibility of government, and that they wish to do about as the white people do?—A. We wish to do as the white people do.

By Mr. HOOKER:

Q. How many acres of land does each head of a family hold?—A. Eighty acres.

Q. What is the tribe disposed to do with the balance of the land? Do they want it sold or do they wish to retain it?—A. We do not wish or intend to sell any of this land, because of the small piece of land we have got in this reservation; we may increase in the tribe, and then we will want this land.

Q. Do you want to hold the balance in common, that is, beyond the eighty acres to each head of a family?—A. Some of us have no time to work, but we are waiting to get the time and we will then open up farms.

Q. Has there been any failure on the part of the government through the civil agents appointed by the Interior Deportment to pay the annual amount which is due to the tribe of the Winnebagoes? Have they failed to pay over to them the moneys which were due to the tribe yearly from the government, heretofore, under any agent?—A. I do not know for certain; there was a pretty good annuity, but in some way or other they are kind of easing down on the annuities.

Q. Do they get that annuity in the shape of implements of husbandry, tools, &c., for farming, instead of in money, as in former times?—A. We do not know what happened, but they kept the money back at Washington, or else the money has been destroyed, or something else, for they do not send it here. We only get $3 a head.

Q. What was the number of the tribe at the payment of the last annuity?—A. About sixteen hundred.

Q. They received $3 a head?—A. Yes, sir.

Q. What became of the balance of the money that was due your Indians?—A. I do not know what became of the rest of it.

By the CHAIRMAN:

Q. Did you not get any implements for farming, any machinery, tools,

wagons, teams, or anything of that kind?—A. Yes, sir. We always got a little something of that kind; plows, and one thing or another.

Q. How much would that amount to, if turned into money, per head?—A. I do not know; I have not been their chief very long. I only got into the chieftainship last spring, and I cannot learn those things very fast.

Q. Do you understand that if the agent of your tribe and of the other tribes of Indians was assigned by the War Department that these agents would be governed by the same laws and be bound by the same treaties that the present civil agents are?—A. I understand about that.

OBJECT TO THE TRANSFER.

Q. If the payment of the annuities due to your tribe could be more certainly made to them through the agents appointed by the War Department, on account of their being held to a more rigid accountability—if the War Department should assign as agents to have charge of your tribe honest and faithful men, do you not think that it would be better to transfer the management of your people to that department; would it not be better for you all?—A. I object to the military officers, and have objected, and will object, all the time. If we get honest men, and they will send our money to us, I would be well satisfied.

WHITE SPIRIT, chief of the Winnebagoes, examined by means of an interpreter.

By the CHAIRMAN:

Question. You have all been here about the same length of time, I presume, and you all understand pretty much the same things in the same way?—Answer. Yes, sir.

Q. Do you understand the difference between the military and the civil administration of Indian affairs, as stated by General Hooker? Do you understand that if the military has control of your agency they would not have authority to punish any more than anybody else? Have you any preference as to which department, the civil or the military, should have the management of your people?—A. I am of the same mind as the other chiefs. We have all talked about this matter before.

Q. You say you understand the difference?—A. Yes, sir.

Q. You want honest men?—A. Yes, sir.

INDIANS DESIRE TO HOLD PROPERTY IN SEVERALTY.

Q. Are you in favor of holding your property in severalty, or do you prefer to hold it in common?—A. I would rather hold it separately.

Q. How much do you hold at present?—A. Eighty acres to each family.

Q. Is that enough for each one, or do you want a little more?—A. We would rather have a little more if we could get it.

Q. If the land were divided up, and one hundred and sixty acres allotted to each family, what would you wish to do with the balance? Would you prefer to sell it or retain it?—A. We all feel that we want to keep what little we have got for the children that are growing up. If we sell any of it now we will be short of land when the children grow up.

WINNEBAGOES DO NOT DESIRE TO REMOVE.

Q. Would you like to remove from this country, or do you prefer to remain here?—A. We never intend to move from here. We have our lands and our homes here, and we intend to stay here as long as we live.

Q. Do you have eighty acres for each one of you or to each head of a family?—A. Eighty acres for each head of a family.

WHITE BREAST, ex-chief of the Winnebagoes, examined by means of an interpreter.

By the CHAIRMAN:

Question. Have you any different views from those whom you have just heard testify?—Answer. No, sir; I am of the same way of thinking.

Q. You all want to hold your property?—A. Yes, sir.

OPPOSED TO THE TRANSFER.

Q. None of you want to turn the management of Indian affairs over to the military authorities?—A. No, sir.

Q. Do you want to manage your own affairs for yourselves very soon?—A. Yes, sir.

Q. And become citizens of the United States and have the laws extended over you just as the white people have?—A. Yes, sir.

THE INDIANS DESIRE TO BE NATURALIZED.

By Mr. BOONE:

Q. Do your people desire to have the establishment of courts of law for the punishment of crime?—A. We would like to be naturalized citizens, and get our citizen papers, so that we could be treated just like citizens, and have courts and the same laws as the whites, and be tried for our crimes and punished for our crimes.

The CHAIRMAN. If any of the other chiefs present differ in opinion from those that have already testified, let them rise and state wherein they differ.

[The interpreter repeated the statement to the assembled chiefs and warriors. No response was made.]

JOHN BARTLETT, chief of the Winnebagoes, shook hands, and addressed the commission through an interpreter, as follows:

I am glad to see men such as you are. I was anxious to see the Commissioner a long time ago, as I had some little stories I wanted to tell him.

We live very poor. Whenever we do not work very hard we are starving. It has been a good while since we have drawn any rations. We used to have plenty of flour, and beef killed for us. They have shut down on that now.

By the CHAIRMAN:

Q. Why can you not get along as well as your white neighbors? They do not have rations issued to them.

JOHN BARTLETT. I am trying my best to do that. It has been four or five days from to-day since I have been thrashing my wheat. I got one hundred and eighty bushels of wheat four or five days ago.

Q. What do you get for your wheat?—A. Fifty cents a bushel.

Q. In cash?—A. No, sir; in trade.

Q. Does anybody pay cash for wheat here at all?—A. I was working ten days trying to sell grain for cash, and could not raise ten cents in cash.

Q. Have you anything further to say?—A. I want to be naturalized. I was elected chief last spring.

Q. Have you any complaints to make?—A. I have been working at the carpenter trade five years. I used to get $335 a year. When I began to farm I owned a little more than I used to own.

By Mr. STEWART:

Q. Then you make more by farming than you used to make by working at the carpenter trade?—A. Yes, sir.

By Mr. HOOKER:

Q. What did you get for your crop this year, and have you more than one party to whom you can sell?—A. Only one dealer.

Q. Who is he?—A. Our agent's brother.

Q. You had one hundred and eighty bushels of grain?—A. Yes, sir.

By the CHAIRMAN:

Q. Are you posted as to the value of goods at Decatur and other places?—A. Yes, sir.

Q. And you are acquainted with the prices here?—A. Yes, sir.

Q. How do they compare?—A. I have not sold any grain.

Q. I am not talking about the grain; I am talking about goods. You say you have to take goods for wheat. How much more do you have to pay for goods here than you do at the other towns?

[To the interpreter: Can you answer that question yourself? I ask you that because I take it Bartlett would not be as well posted.]

The INTERPRETER. I can hardly tell.

The CHAIRMAN. Ask the question of Mr. Bartlett.

JOHN BARTLETT. Whenever we go to Sioux City we generally get things cheaper than here. We can buy a good deal more there for three dollars than we can buy here.

Q. But you don't give us the difference. Can you buy as much with two dollars there as you can with three dollars here?—A. I think we can buy as much for two dollars there as we can for three dollars here.

By Mr. HOOKER:

Q. What is the difference between the price of wheat at Decatur or Sioux City and at this point?—A. Sometimes it goes as high as seventy cents a bushel there, and sometimes as low as sixty, but here we sell only for one price. In Sioux City at one time wheat sold for eighty cents a bushel.

By the CHAIRMAN:

Q. That was some time ago, I take it?—A. Yes, sir; about a week ago.

Q. I think wheat has fallen very much within the last few days, has it not?—A. I understand it has been less; but still once I went up there with a load of wheat and sold it for fifty-five cents a bushel.

By Mr. STEWART:

Q. What is there to prevent your going there and selling your wheat, if you want to; if you can make so much more by going there, why do you not do it?—A. Well, Dan White (the agent's brother), has a claim on me for about one hundred and two bushels of wheat, and he keeps it; but if I can make more by going to Sioux City with it, I will take it there.

Q. But what does Dan White say to that?—A. Dan White would object; but I think I can make more money by going there.

Q. Do you not have to buy during the season, and having no money you thereby become obliged to sell your crop to the man from whom you

buy when the time comes?—A. I have not made any arrangement or bargain before.

Q. I suppose that if you were not indebted, and did not become indebted to the trader here, there would be no objection by the trader to your going off and selling your wheat and grain where you pleased?—A. He might stop me, because there was a fellow on the edge of the reserve to whom I owed twenty or forty bushels of wheat; I intended to give it to him; I spoke to the agent, and the agent refused to let me go and take my wheat down there.

Q. What reason did he give for not letting you go?—A. He would object, because he was afraid I would not be able to pay his brother.

Q. Might not save enough to pay the man what you owed?—A. Yes, sir.

HOWARD WHITE, agent, stated as follows: This Indian, Bartlett, separated from his wife last spring, and at a trial he had about that time there was a division made of the property. It was decided that one-half of the property should go to the wife, and one-half to him; and, after the division was made, and the wheat was thrashed, he proposed to me that he would pay all his debts at that time. I objected to his paying before making the division with his old wife; I did not object to his paying out of his share, but I wanted her to have her full amount that was due to her. That is what he has been speaking about.

Mr. HOOKER [to the interpreter]. Explain to the Indian what the agent, Mr. White, has just said, and ask him if he has anything to say in reply to it.

Chief BARTLETT. When we had that trial it was decided that there was to be a division of the wheat—that is, of the wheat left over after paying Dan White, and all the chiefs agreed to it, that I should pay my debts then, and divide what was left over with my wife.

MARRIAGE RELATION AMONG THE INDIANS.

By the CHAIRMAN:

Q. What is the law in relation to divorces? Have you a law on that subject; and, if so, does it require some good reasons to bring about a separation, or can a man put away his wife when he pleases?

Chief BARTLETT. I do not know of any law; when a man is not able to agree with his wife then they will have to part.

Q. How is it as to the marriage relation in your tribe; do the Indians have a plurality of wives, or are they confined to one wife?—A. I have often seen a man who had two wives. Some of us keep one, and some of us keep two.

Q. Are these chiefs who have testified here as desiring to live as white people aware that we punish people for having more than one wife?—A. I am, myself, satisfied now to keep one wife. We have to work mighty hard here. I had a horse stolen from me last spring. That cost me a good deal; and we want something here by which we can punish very severely for that.

HENRY RICE recalled.

The WITNESS. Our brothers are sent over here to attend to what we need, and to see what we need. I want to say that we need several things.

INDIANS DESIRE TO BE NATURALIZED.

By the CHAIRMAN:

Question. What are they?—Answer. I would like very much to be naturalized, and everybody knows that we are trying to be civilized.

We are afraid that we are going to be moved from this place. We object to that, and we are very anxious to get our patents for this land, and our civilization papers. These two papers we want to get.

By Mr. BOONE:

Q. Patents for your lands and naturalization papers?—A. Yes, sir.

INDIAN ANNUITIES.

By the CHAIRMAN:

Q. Any other matter?—A. Yes, sir; we want to know what becomes of the money that they used to buy beef and flour with that used to be issued out to us. Such men like me can make their living well enough, but some of the old folks, we don't know how they can make their living at all. We younger men can make our living very well, but the older ones, we don't know how they can live. The money that the beef and flour was bought with, we would like to know what has become of it. If we only knew what had become of this money we would stop some of these goods annuities.

Q. You are not satisfied with receiving it in goods?—A. No, sir.

Q. You want to get it in money?—A. I would like very much to get the money in cash annuities.

Q. Why do you prefer it?—A. Some of the small children would not get anything of the annuity goods. The children don't get any goods at all; no goods annuities are paid to them.

By Mr. HOOKER:

Q. Do I understand you to say that at the last annuity payment the tribe got three dollars a head, and that the tribe at that time consisted of sixteen hundred people—that would make $4,800; what became of the balance of the annuity due to your tribe?—A. I do not know.

Q. Who paid the last annuity to you, and when and where was it paid?—A. Last spring.

Q. Who paid it?—A. Howard White.

Q. The present agent?—A. Yes, sir; our present agent. There was one year we did not draw any annuity.

Q. What year was that?—A. A year ago last summer.

Q. You mean to say that you were paid no annuity in money that year?—A. They did not pay us any cash annuity the year before last.

By the CHAIRMAN:

Q. The question is this: You say that you received $3 a head only at the last payment. Did you not receive something in the way of agricultural implements, or something of that kind?—A. We got goods annuities last fall, and the cash was paid out this spring.

Q. You received a cash annuity this spring?—A. Yes, sir.

Q. These two payments were all that you were entitled to receive—the goods you got, and the $3 per head that you received—was not that all that was due you?—A. I do not know. I cannot answer that fully myself.

Mr. HOOKER. If you have any further statements, or any complaints to make, state them briefly.

The INTERPRETER. I will state the question to him.

The CHAIRMAN. Ask him if he wants to send any message to Washington—to make any complaint against the management of affairs here.

HENRY RICE. All I want is that you will report what we have said at Washington.

HOWARD WHITE recalled.

By Mr. HOOKER:

Question. I want to ask the agent this question: Mr. White, did you pay the last annuity?—Answer. Yes, sir.

Q. How much was the annuity?—A. Three dollars a head.

Q. How many were there?—A. I think 1,460 odd.

Q. Did you pay $3 per head to these Indians?—A. Yes, sir.

Q. What became of the balance of the annuity?—A. They were furnished some five or six thousand dollars' worth of goods by the Commissioner.

Q. By the Commissioner of Indian Affairs?—A. Yes, sir.

Q. Is that all that were furnished?—A. And agricultural implements of different kinds.

Q. To what amount—what was the value of the agricultural implements?—A. I cannot tell exactly without referring to the vouchers.

Q. As much as the goods?—A. I think more than the goods.

Q. Of agricultural implements?—A. Agricultural implements and supplies for the miller; we have to buy leather and lumber and tools and farming implements.

Q. Those purchased one year do not have to be paid for the next year, do they?—A. We have to keep up the supplies.

Q. They do not wear out in one year, do they, any more than the mills do?—A. Of course we do not have to buy a full supply every year, but we have to buy some of them every year.

Q. Taking into consideration the $6,000 worth of goods bought at Washington, and the implements of husbandry that were furnished them, and the $3 per capita which you paid them, what would it all aggregate?—A. Besides that——.

Q. ANSWER my question first. How much would they aggregate? You say you received $6,000 worth of goods from Washington and agricultural implements to the same amount, and you paid $3 per capita to the tribe; what would that all aggregate?—A. Something like fifteen or sixteen thousand dollars, I believe; sixteen or eighteen thousand dollars.

Q. You already said that the amount coming to this portion of the tribe was about $26,000, not taking into consideration the amount going to the Wisconsin part of the tribe?—A. Yes, sir.

Q. What became of the balance of the $26,000?—A. The whole $10,000 was expended for employés.

Q. How was that paid, and to whom?—A. Our employé force, numbering some fifteen employés, probably—I don't know exactly how many—and for the support of the industrial boarding-school, buying supplies there, &c.

Q. What I want to know is, how do the Winnebago Indians, or any other tribe of Indians, know whether they get the full amount of annuities which they are entitled to; how can they ascertain whether they have received the full amount?—A. It is difficult for them to tell, and I am unable, as agent, to tell.

Q. In other words, what sort of a check do these tribes of Indians have upon the department at Washington, or upon an agent here, with reference to the payment and expenditure of their money? Have they any such check?—A. They have not, sir.

Q. They are entirely dependent upon the department at Washington and the Indian agent here?—A. We explain to them, where we can, what they cost, but very often the agent does not know, as they are sent to him without an invoice.

Q. Have they no means of knowing whether they get the amount of annuities due them or not?—A. Not exactly; only approximately.

Mr. HOOKER. I want the interpreter to say to these chiefs who are here, that the object of our inquiry into this matter is with regard to transferring the Indian Bureau from the Interior Department, which is the civil department of the general government, to the War Department, and to establish a character of officers who will be held to a rigid accountability, first to the United States Government and then to the Indians themselves—a class of officers who will see that they get all they are entitled to under the treaty. That is the object and purpose of this investigation. If we find by the evidence before us that the agents of the Interior Department will receive and faithfully account to the Indians the amount which is due to them, why then we are disposed to continue it with the Interior Department. But if we find that the Interior Department or the Commissioner of Indian Affairs, or the agent here, or anybody else, does not account to them for their annuities, then we want to put a set of agents here that we can hold to a sharp and rigid accountability.

ELECTION OF CHIEFS.

Mr. WHITE. The Indians generally have elections every year, so that those who are elected can learn but little. They change every year; but if they happen to elect one for two successive years he may possibly learn a little. The next year they will change to another. When any one of the chiefs learns anything, he will not tell it to the rest of the chiefs.

SALT LAKE CITY, UTAH, *October* 23, 1878.

Capt. FREDERICK E. TROTTER sworn and examined.

By the CHAIRMAN:

Question. We are taking testimony in regard to the propriety of transferring the management of the Indians from the civil to the military department of the government. Anything that you can say in reference to the subject of the Indians will be thankfully received. Have you been associated with any Indian tribe?

The WITNESS. For the last eight years, more or less. I was one year at Camp Stambaugh with the Shoshone Indians.

Q. Were you located there in the capacity of agent or anything of that kind?—A. Simply in connection with the tribe. I have never been connected with the Indian Department at all.

THE TRANSFER SHOULD BE MADE.

Q. You have observed the working of the Indian Department? What do you think of it? Do you think it would be bettered by a change, or is it going on as well as could be expected?—A. As far as the actual benefit to the public at large is concerned, I think the transfer would be beneficial by reason of the very accurate system of accountability as enforced and conducted in the Army.

Q. You mean so far as dollars and cents are concerned?—A. Yes, sir; so far as dollars and cents are concerned.

INDIANS CAN BE CIVILIZED.

Q. What do you think of the propriety of trying to civilize and christianize the Indians and bringing them up to the standard of citizenship

with others; do you think that can be done?—A. I think it can be done to a very great extent. My impression is that the first step in civilizing these Indians would be to make them a pastoral people, rather than an agricultural people, for the reason that the average Indian buck considers labor derogatory to his personal dignity and pride, and the care of flocks and herds is something that they are accustomed to, as they care for their ponies. They can take the same care of cattle and sheep that they do of their ponies, and they require no greater care. The greatest trouble I have seen in the civilization of these Indians is the effort to get them to plowing and living permanently in one place. I do not think it would prove very easy to civilize these Indians as long as they have their tepees and blankets.

Q. You think they ought to be induced to lay aside their blankets?—A. I think the use of blankets and cloths for tepees could very easily be dispensed with. Send them out to agencies where they have sawmills and lumber, as they have at a great many of them.

Q. What course of management, in your opinion, would be best calculated to teach them this pastoral work; or have you any better scheme to suggest?—A. I am not prepared to say that the transfer of the bureau to the Army would benefit the Indians in the respect of making them farmers.

Q. You think it would relate more particularly to the certainty of their getting all their supplies?—A. Yes, sir; to the economy of the administration and of their getting their supplies.

Q. Then, as to that, I suppose any good man who would teach them, and who was capable of teaching them, is all that is necessary?—A. Yes, sir; you might find them among Army officers.

INDIANS AS TEAMSTERS.

Q. You think it is possible, if properly managed, by anybody, to finally bring them up to the standard of citizenship?—A. I think they could be made very useful members of society. I have seen a great many instances of it. I came down last May from the Bannock Agency, where the Indians have gone out this summer on the war-path. I went to the agent and asked if he had any Indians he wanted to hire to bring down the baggage of the troops. One was there, and I took him along and gave him the same pay that I paid the others. Practically my men had to manage and drive his team, but it pleased him and he showed a desire to do this thing. While I was there three Indians were clamorous for their piece of ground. They farmed at the agency as a community.

Q. Where was that?—A. The Bannock Agency, where the Bannocks went out on the war-path, this summer. They have raised there this year, I understand, some eight thousand bushels of wheat.

Q. Do you know anything about the cause of the war?—A. Yes, sir; that is a long story.

CAUSES OF THE BANNOCK OUTBREAK.

Q. Give it as briefly as possible.—A. These Bannocks, prior to the Nez Percés War, very rarely came to the agency, but were mostly hunting in the mountains in Southwestern Montana, and near Eastern Idaho. The Nez Percés war drove them into the agency. That agency was feeding quite a number (several hundred) more Indians than they had supplies for. Their rations were extremely meager—five pounds of flour and four pounds of meat were a week's rations for an able-bodied Indian. They made complaints to me frequently, as the commanding

officer of the troops there. Their universal statement to me was that three days they had something to eat and four days they had nothing—that was the reason.

Q. They were really fighting for their bread and meat?—A. They were in a semi-state of starvation.

Q. There happened to be more than were expected, and that was the reason they were not provided for, and there was no fault attached to it?—A. The agent reported to me that he had made a statement to Commissioner Hayt that those rations would be required at a certain time, but he had not got the authority up to that time to do it, and he went off, on his own account, and bought some rations. Afterwards he was authorized to do so, but the Indians had to be let go, because they had nothing to give them. They gave them passes to go. The Indian nature, of course, is extremely excitable. Many of these Bannocks went off on the war-path this last summer. Buffalo Horn was one of the bravest of the brave, with an excellent recommendation from Generals Crook and Miles for services as a scout. There were a dozen or fifteen of those Indians turbulent and excitable. He wanted me to enlist them for government service. He told General Crook the same thing in an interview, and I think if those fifteen Indians had been enlisted, perhaps the exciting cause of this war would have been removed. They all gathered on the Camas prairie east of Boise City, which is a sort of common trading ground for the Bannocks, Umatillas, and Nez Percés, and some Crows—the Indians from Oregon and Idaho—where they trade horses and do their year's trafficking—and the war commenced by one or two of these Indian bucks, who were full of life and vigor, killing two herders, I think their first. From that they thought they were in for it, and it grew out of that.

Q. My object was to find out what the cause of the war was. Sometimes it is from whisky, we hope—making some one drunk, and the deviltry begins; but sometimes it is for the want of good faith, as they think, on the part of the government—the government's failing to furnish them all they promised to. But I see from your statement there being more than could be provided for, there might be no fault.—A. The Commissioner's plea for not furnishing them rations was that he had no money to do it with. That was the plea to the agent through the telegrams I saw. Of course the insufficiency of the rations made the Bannocks discontented; the war, I suppose, grew out of that.

By Mr. HOOKER:

Q. How long an experience have you had with the Indians?—A. As I say, I was a year with the Shoshones, I was three years at Fort Fetterman with the Sioux and Arapahoes, when they were all running together. They all passed Fort Fetterman going to the Bighorn country hunting buffalo. I spent three years with the Utes and in Southern Utah.

Q. Have you ever been in Colorado?—A. I have never been in Colorado. Last winter I spent at the Bannock Agency, to prevent an outbreak which did not occur until this summer.

Q. Allow me to ask you if at each agency at which you were stationed there were agents under the civil department?—A. Yes, sir; there were local agents.

Q. Appointed by the Indian Commissioner and Secretary of the Interior?—A. Yes, sir.

Q. At each one of the posts have there been troops?.—A. Yes, sir. At each of the posts there were troops stationed.

AGENTS' POWER OVER THE INDIANS.

Q. State to the Commissioner, if you please, what authority or power these civil agents have over the Indians when they exhibit a disposition to break out and go on the war-path?—A. None whatever that I know of; none at all.

Q. None at all?—A. No, sir; none at all. A decided, prompt man has his personal magnetism to control them; their fear of him.

Q. And if he attempts to exercise any control over them, he has to call on the troops at the posts?—A. Yes, sir; he has to do that invariably.

Q. What has been your observation as to the honesty and integrity with which these civil agents have dealt out the rations and paid the per capita which is due under the annuities to the Indians under the treaties with the government?—A. I do not know that I can say anything against their honesty in such a way as one would ordinarily testify, from my personal knowledge.

Q. If you have any information of any instances state them; any instances of the failure to pay over these rations or money annuities per capita due the Indians from the government.—A. No, sir; I don't know that I have any information; I don't know anything definitely myself.

Q. You have no personal knowledge?—A. No, sir; no personal knowledge.

Q. In those instances in which you refer to the Bannock Indians who went out upon the war-path during this last summer, you say they were unable to give them rations. Was that inability from the failure on the part of the government, or the Commissioner of Indian Affairs, or the Secretary of the Interior to furnish supplies; or did the failure arise from want of proper dealing out by the agent at the post?—A. I think it arose simply from the deficiency for the purchase of them. I gathered that from telegrams from Commissioner Hayt, shown me by the agent himself at the time.

Q. He put it upon that ground?—A. Yes, sir.

HOW SUPPLIES ARE PURCHASED.

Q. How were the supplies sent to the Bannock agent?—A. The flour was bought in open market, and the beef was purchased at the agency.

Q. What open market?—A. I think there were twenty thousand pounds of flour purchased by contract; I think what we call in open market.

Q. By the agent himself?—A. Yes, sir. He calls for bids for supplying so many pounds of flour and beef and accepts the lowest bidder. I believe those contracts have to be accepted by the Commissioner at Washington.

Q. We want to get at whether the deficiency of supplies did not very often arise from the failure to obtain the transportation under the civil system—the system of transportation under the Interior Department?—A. I think in this case not, sir; the transportation could have been procured very easily.

Q. No difficulty there?—A. No, sir.

Q. Do you think the rigid system of accountability as practiced by the Army would economize to the government in the matter of transporting these supples, and at the same time secure to the Indians what they are entitled to?—A. Yes, sir.

THE TRANSFER SHOULD BE MADE.

Q. Then you think their transfer would be beneficial to the Indians?—A. Yes, sir; in that they would receive every thing from the government that they were entitled to.

Q. And the government would be benefited in case of the failure on the part of the Indian agent, either from incapacity or dishonesty, because the means of detection are much greater with an officer over and above him?—A. Yes, sir; they could be detected instantly; and another point, in the case of the civil agent at Lemhi Agency. Some months before that man could be relieved the question of his dishonesty was a matter of notoriety. In the case of the Army officer he could be removed in ten minutes.

Q. What was the notoriety?—A. A box shipped by him was broken open and was found to contain blankets and a variety of goods addressed to White Water, Michigan, all belonging to the Indian department, and had been shipped there for the Indians. His plea, published in the papers, was that he had a right to buy them, and he had been buying them to ship to White Water, Michigan

Q. From whom?—A. Himself, as Indian agent. He would have been there still had it not been discussed by the journals in that Territory. The question was, how could he pay for them and ship them back to Michigan.

By the CHAIRMAN:

Q. Do you recollect his name?—A. I do not now remember his name.

Q. At what agency was that?—A. Lemhi Agency, one hundred and fifty miles north.

By Mr. HOOKER:

Q. Have you ever known of an instance of successful prosecution of an Indian agent in the circuit courts who had defaulted?—A. No, sir; I have hardly been in a position to observe that.

Q. If he had been an Army officer, under the present system of accountability, as at present practiced by the Military Department, he would have been called to account at once?—A. Yes, sir, of course.

ISSUING SUPPLIES BY THE ARMY.

By the CHAIRMAN:

Q. Do you think if the military department had control in this matter, that the rations and money would be distributed properly to the Indians? Is there no way of detecting them in case they do not? They are not absolutely bound to give it; but would there be a way of detecting?—A. Yes, sir. In the first place, their issue would have to be witnessed by some other officer than the agent.

Q. Is not that the case now?—A. No, sir.

Q. You say it would have to be witnessed by some other officer than the agent. Does the man who issues rations in the Army have to call a witness?—A. Yes, sir; he is watched right along.

Q. Is that the law?—A. Yes, sir. If he issues a pair of stockings, it has to be duly witnessed.

Q. Do you mean the transaction itself has got to be witnessed, or merely that he gives a certified voucher witnessed in the way of ordinarily witnessing a deed, or anything of that kind? Does some man stand by and see it done?—A. We make a requisition for so much rations, and the commanding officer of the post directs the quartermaster to issue them. The quartermaster is bound to issue not a pound over that, and I am bound to see that I get the full amount.

Q. Suppose the quartermaster issues two pounds for one, and the party accepts it, what means are there of detection?—A. At the end of thirty days he takes an inventory of everything he has got. He is only al-

lowed 1 per cent. for wastage, ordinarily, and anything he is short beyond that 1 per cent. (not of all he has got on hand, but what he actually issues) he has to make good. He might have a thousand pounds of sugar on hand and had issued a hundred. He could only take 1 per cent. on the hundred issued. If he has not got that on hand, the commanding officer discovers that.

Q. Supposing it is assumed two pounds of sugar have been issued, and he only issues one; of course, he gets a percentage on quantity. Suppose he keeps that back and issues that to himself, or gives it away, how do you detect him? If the man to whom he issues does not know it, who does? How is it if he deceives him? Might he not issue him short weight and the man not know it?—A. I don't see how he could do that. The stores are weighed on scales just like they do at grocery stands; on one side you would see the weight and on the other side the quantity. He stands there to see that he gets his five pounds, and I stand there to see it issued. The Army officer is liable to be detected.

Q. I inferred from your remarks that you thought a mistake could not be made. I had received the impression, from talking with others, that these things could be done; not that they are often done, but that they could be done?—A. I don't understand how it could be done. I have been at it for seventeen years, and I don't think any issuing officer ever got the better of me. It is completed at once between the issuing officer and the party who receives.

By Mr. STEWART:

Q. One is a check upon the other?—A. Yes, sir; one is entitled to receive, the other bound to issue.

Q. It has been asserted by some very strongly that there was just as much opportunity to do it, if they desired to, under the one system as the other; but in case of the Army officers, they had their reputation at stake, their honesty at stake, and it was not likely it would be done?—A. I don't see how it can be done. The system of responsibility in the Army must, I think, be a perfect check upon the acts of officials.

Col. JOHN E. SMITH sworn and examined.

By the CHAIRMAN:

Question. Our business is to inquire into the management of the Indians. I take it you have had considerable experience in that line; that you have been more or less with Indians. Have you had considerable experience in the management of the Indians?—Answer. I have had considerable experience with the Cheyennes, Sioux, and Arapahoes.

THE TRANSFER SHOULD BE MADE.

Q. Our main object is to ascertain whether it would be better for the Indians or for the government, or for both, to have the Indian Bureau transferred from the Interior to the War Department. That is our main question; and we wish to take evidence upon all subjects with reference to the management of the Indians. Whatever information you have bearing upon the Indian question the committee would be glad to receive.—A. To answer your question I am decidedly of the opinion that it would be to the interest of the Indians and to the economy of the government to transfer the bureau to the War Department.

Q. Please give the commission your reasons for thinking it would be better pecuniarily, and whether better for the future good and development of the Indians in civilization and in making them self-sustaining.

Do you believe it is possible to make them self-sustaining?—A. It would take a long time to do so, sir.

Q. Your idea is that it is better for the payment of the money, and a great advantage to the Indians in their present condition, to have the bureau transferred to the Army?—A. Decidedly so, sir.

Q. If you have any particular reasons for so thinking, which undoubtedly you have, please state them. Do you think it would be better from a financial standpoint, or is that one consideration combined with others?—A. Financially there can be no question of it. The appointment of Indian agents under the present civil service is temporary, and dependent entirely upon political conditions. The salary is no inducement, and unless these agents can make money out of it there is no object in their having it. I would call the attention of the committee to the fact that agents, for the pitiful sum of $1,500 a year, are intrusted with the responsibility frequently of from one to five hundred thousand dollars. It cannot be expected that these men will be honest. In sacrificing their social relations, as well as accepting the conditions necessaaily which they have to incur in living among the Indians, render it necessary that there should be some other object beside their salary to induce them to go there. It is a point that I have frequently, during my intercourse with the Indians, urged upon the Indian Bureau, and I say that it cannot be expected that these men will be honest. I have seen very few honest Indian agents in my life. I may be going a little far in saying that, but in my opinion I have seen but very few honest Indian agents.

Q. You have seen military men whom you thought were honest?—A. I have, sir; for the reason that their positions were more permanent, and that no military man could afford to sacrifice his position for the sake of a few dollars.

Q. Have you had any experience among the semi-civilized Indians—those tribes that have become what we call civilized or semi-civilized?—A. No, sir; not a very great deal; most of my experience has been among the wild tribes.

POWER SHOULD BE GIVEN TO MILITARY AGENTS TO PUNISH.

Q. In the management of them are you of the opinion that full power or authority should be given to the military to punish any offenses without calling on the department to give the orders; should they have full authority at their agencies and near them?—A. I think they should; yes, sir.

Q. How far would you go with that; to the extent of conducting a war?—A. No, sir; I don't think I would; but discretion should be left with the officers, for the Indian does not understand anything but power. I am satisfied from my own experience that it is the only way you can make the Indian tractable. If he does not fear you he will do as he pleases. I believe we should do justice at all times to the Indians, but justice is not always done to them, which I believe is the cause of much of our recent troubles. I mean justice has not been done to them both by the government and the agents.

Q. I suppose you are of the opinion that justice is what they want, and it would more likely be had from the military than the civil?—A. That is decidedly my opinion.

Q. The class of Indians which we have been with heretofore were civilized?—A. So I understand.

Q. We are now inquiring as to the other class; we have met but very few of them. That was the object we had in seeking your testimony, to

see how you managed the other class. I suppose it would be difficult for you to draw the line as to just how far you would go were the authority to be extended to the military. That is the question which is anxiously looked to, as to what amount of authority should be given to the military in case the Indian Bureau should be turned over to that department. What is your opinion as to that?—A. I think that should rest with the highest military authority. I would not intrust that to a subordinate officer.

Q. If I understand you, the highest at the post should be the one?—A. No, sir; not unless an emergency should occur. What I mean by "the highest military authority" is the Secretary of War.

Q. Would you expect, if there were little difficulties at the agency, that you would have to wait for an order from Washington before you could settle it?—A. That would devolve upon the officer, and of course if he exceeded his authority he would be held responsible.

Q. You do not understand me. For instance, take a detailed officer of your Army and put him as agent. Do you think he should have any more authority than to do the clerical business of issuing rations and money, &c.? Do you think he should have authority to go any further than that; or should he have power to go on and punish the participants in the difficulty? Might he go on and mete out any punishment to the Indians for offenses without first calling on the authority at the War Department?—A. I assume that rules and regulations would be made limiting that authority; a certain amount of authority necessarily must be given, but that could be limited. You ask the question whether I think the agent should be authorized to make war?

Q. Yes, sir.—A. I do not think that authority should be given, unless under very extraordinary circumstances. I think the authority to punish minor offenses should be given. If the officer were not discreet he would be relieved.

By Mr. HOOKER:

Q. State to the commission with what tribes of Indians, at what stations, and for what periods you have been connected with them.—A. I had something to do with the Sioux, Arapahoes, and Cheyennes, at Fort Phil. Kearney, during the years 1867 and 1868, and more intimately from 1870 till 1874, at Fort Laramie.

Q. What Indians?—A. Sioux, Cheyennes, and Arapahoes, more particularly Red Cloud's band of Sioux, with whom the Cheyennes and Arapahoes were associated.

DISHONESTY OF CIVILIAN AGENTS.

Q. Have you known of any instance where the civil agents, under the Interior Department of the government failed to issue rations due the Indians from the government?—A. I have no positive knowledge, but I have every reason to believe that that has been the case. I had no authority over the Indian agents, and therefore had no means of satisfying myself of the facts, except the impressions that I got that they were not dealing fairly with the Indians.

Q. Under the civil service there is a double agency, is there not? The Indian agent is intrusted with the issuance of the rations and the per capita annuities due to the Indians under the treaties, and the officer of the Army is there to sustain the authority of the agent. Is there not in this system a sort of double accountability and double authority; an officer to oversee the issuing of supplies?—A. That has never been the case under my observation. When the agency was established thirty

miles below Fort Laramie there was no officer superintending the issuance of supplies.

Q. They were issued by the agent alone?—A. Yes, sir.

Q. He had no inspecting officer to witness the issuing of supplies?—A. No, sir; those supplies were inspected at Omaha.

Q. The civil agent is absolutely omnipotent so far as issuing the rations is concerned?—A. So far as my experience goes, he is.

INDIANS WELL ARMED WHEN OUTBREAKS OCCUR.

Q. How do you account for it that the Indians happen to be well armed in these conflicts between the government and themselves?—A. It is to be accounted for in several ways; dishonesty of traders is one reason.

Q. The licensed traders of the post?—A. Yes, sir; through the connivance of the agents; and also by hangers-on, who are always about these agencies, and who always try to smuggle arms and contraband articles for trade with the Indians.

Q. Is it not true that the Indians, when these complications break out, are found to be as well and even better armed than the troops—the Indians in these conflicts turn out to be better armed than our troops?—A. It seems to have been the case in the last three or four years.

SEIZURE OF ARMS INTENDED FOR THE INDIANS.

Q. Have you ever had occasion, while acting as commander at these posts, to seize upon any arms which were intended for the Indians?—A. Yes, sir.

Q. State the circumstances under which you did it.—A. Some time during the summer of 1873 it was reported to me that arms were being taken to Red Cloud's Agency on the North Platte River. I will state, however, that it was reported to me previous to that that some freight-wagons, in crossing the North Platte River, had broken down in the river, and that among the freight on the wagons were a number of cases of Winchester arms. Afterwards it was reported to me that arms were being taken over to the agency—I was just trying to remember whether or not the agency had been removed then to Camp Robinson; I think it had been. I sent a company down to intercept and take possession of these arms, which it did.

Q. State to what extent, and the character of the arms.—A. They were caliber .50, Springfield muskets. I think there were three cases of them—three or four—I am not positive now which. The arms were taken possession of and immediately the agent telegraphed to the Interior Department to the Commissioner of Indian Affairs.

Q. Who was then Commissioner?—A. I would say to the Interior Department; who was Assistant Seretary of the Interior in 1873.

Q. Give the date.

Mr. BOONE. I think it was Mr. Cowen.

The WITNESS. Yes, I believe it was. I immediately got a telegram from Mr. Cowen directing me to release those arms.

By Mr. HOOKER:

Q. You stated to him that you had captured the arms?—A. No, sir; the agent did, and I immediately got a telegram from him that those muskets were being furnished for the protection of the employé's of the agency, and to release them. I did so upon that order, and I subsequently found that those same arms were in the possession of the Indians.

Q. What Indians?—A. The Sioux Indians; the Ogalallas.

Q. Would it have been possible for those arms to be transmitted to the Indians except by the connivance of the Indian agent or trader?—A. No, sir; it would not.

Q. Do you understand that in transferring the bureau (if it should be the pleasure of the legislative department to do so) to the War Department that it would necessarily imply that Army officers should be detailed as agents at the various posts, or do you understand that the Secretary of War might employ any agents he saw fit?—A. I should think that would be the case. That would be my understanding, that Army officers would be employed.

Q. Would be detailed?—A. Yes, sir; would be detailed for that purpose.

Q. And if Army officers were detailed under the rigid system of accountability adopted by the commissariat and quartermaster's department would it be possible for frauds to be perpetrated either upon the government, by misapplying appropriations, or upon the Indians, in the way of withholding funds and supplies, without a speedy detection?—A. Anything is possible, but I don't think it would be probable, or at least, as probable as at present.

By Mr. STEWART:

Q. You say the inspection of the supplies was done at Omaha? Were they inspected by the Army officer at that place?—A. I think not, though I do not know. I will not be positive as to that.

SALT LAKE CITY, UTAH,
October 24, 1878—10 o'clock a. m.

Hon. WILLIAM H. HOOPER sworn and examined.

Mr. MCCREERY. This joint committee of the two houses of Congress has been appointed to inquire into the expediency or propriety of transferring the Indian Bureau from the Interior to the War Department. You will please give us your views upon this subject.

THE TRANSFER SHOULD BE MADE.

The WITNESS. From what I have heard (personally I do not know, but from what I have heard) of the corruption of the different branches of the Indian Department and the agencies, I don't think that the Indian gets a fair show. I believe that he will be much better protected and more justice done him if the transfer is made. I don't think that they secure justice.

By the CHAIRMAN:

Question. You said that you believe it would be better to transfer the bureau to the War Department. Have you any reason for so thinking?—Answer. I started out by saying that I believed, from what I had heard, that there is a great deal of corruption in the Indian service; that is, in the civil service as administered by the Interior Department, and as between the two evils that I would take the lesser; that is, I would transfer it to the military or War Department. I think when it once belonged there that the Indians were better satisfied, they were more fairly dealt with, and there was less depredation by the Indians and on the Indians than there was after they were transferred to the Interior Department.

Q. You would choose the War Department as the lesser of two evils.

I wish to ask you a question, and I would like you to give your opinion on it, whether or not there might be something better than either of them. Do you think one or the other ought to have control of the Indian administration, or do you think something else could be done which would be better than either?—A. I would like to extend my remarks touching the Army. I cannot say anything to you, gentlemen, to instruct you in regard to the standing of the Army. You know them, their tenure of office, and their general conduct, and I may say of all the military men I have known through my life, and that is a great many, there is not one who would not rather lose his life than lose his position; there is nothing so horrid to him. Consequently I think his transactions, in all pecuniary matters, through life would be correct. He probably looks at it in a different light from what a great many civilians would look at it. In other words, I think they might be trusted further in handling government funds and dealing with the Indians than a man who would accept that position and disburse twenty, thirty, or forty thousand dollars on a salary of fifteen hundred dollars a year. His position is guaranteed to him as long as he behaves himself, and it is all staked on his honor. If he should violate it in trespassing upon the rights of the Indians, or diverting the money of the government from its proper channel, the government has a more direct access to him than if they were dealing with a man who is a civilian officer. They would have to bring him up and indict him, and he has got his political friends, and he stands more chance of getting through than an Army officer, because the Army officer's own comrades would disown him (and that of itself would be punishment enough) if they knew he had committed any acts of dishonor. Am I right in that?

Q. I am glad to have your opinion. I would remark that we are not confined to the financial question alone.—A. Now I will move on.

SELF-SUPPORT OF THE INDIANS.

Q. What views have you on the subject of self-sustaining?—A. I have had an experience here of 25 or 30 years. No use talking about bettering the condition, morally or otherwise, of any people, whether of civilian or savage, unless you can get his confidence. You can never get it as long as you rob him consequently I would take the people of the Army to get his confidence. I don't believe that this reservation system will ever produce any good—that any good will ever come of it; and yet, to a certain extent, this is necessary to lead to something else. I do not believe any good can come out of bringing up any sect of men if you are going to keep them in idleness; and you can do nothing else with the Indians as long as you feed them on reservations. "Idleness begets vice." I stated to you, gentlemen, yesterday, although it was not officially reported, that I did not think you could make an agricultural people of the Indians, except where you could bring a few of them around the outskirts of the settlements. You might teach them in a small school to be agricultural people, but not in a year or in a hundred years in a broad school. But they are adapted to pastoral pursuits just as the country from two hundred miles this side of Omaha to the base of the Nevada Mountains is for raising stock rather than agriculture. Indians are natural herdsmen. The Indian appreciates stock; he is fond of it; he is a good judge of it; and if you could once get them to understand that they can raise their meat cheaper than they can hunt it, and the sheep that they raise can be sheared once a year, and even before their own eyes fashioned into something that will keep them warm, clothe their women and children, and taking it to market

and disposing of it you can bring back blankets, they would get to loving the sheep; they would comprehend at once that it was to their interest to take care of them; and you might gradually lead them on step by step. Take cattle: they would soon learn to make butter, cheese, and all those things to give them food, and when they could see their cattle were growing around them, and their calves increasing, they would take better care of them directly than the white man, and would watch them more closely. Let them see their fortunes are to be made out of it. Introduce fine stallions among them instead of those ponies which they have and breed them up. They are not wanting in a sense of advantages, and just as they can see their interests advanced, and that the white men are trying really to better their condition, self-interest will come in and will prompt them to greater action; but if they are to be robbed right and left they become discouraged, and they simply fall back on the instincts of their nature and rob and plunder. I do not believe they want to do it. I said these things at one time to President Grant, and his reply was, "Where can you get the honest men to carry that out; where can you get honest men to do these things?" We have had but little or no trouble with the Indians here for thirty years.

MORMON MANAGEMENT OF INDIANS.

By the CHAIRMAN:

Q. How do you account for that? What has been your management of them?—A. It was, in the first place, to recognize the sanctity of their women. They will go off now any time, but more particularly three or four years ago, they would go off on a hunt to be gone three or four weeks, and they would bring their women and deposit them in Mormon settlements. They say Mormons never trouble their women, never interfere with them. Again, another reason why we have never had difficulties with them: While we never made equals with them, when they come to our houses we never turn them away hungry. If we have any old clothing we will give it to them, but we refuse to give them money. We have taught them to glean wheat; we would get them into the harvest-fields. Sixty-miles west of here I have a ranch with a great many cattle on it, and they would come around us and we would learn them to glean and gather the wheat, and get them some breadstuffs, and they would come in and tell us of having stolen an animal; that they were off hunting, and did not get any rabbits to eat, and their squaws and children were hungry, and they killed one of the animals—a little one. We told them it was wrong to kill the little ones; that they should kill the big male ones, not the little ones; that the little ones grow up. The result was, they knew my iron brand on those cattle, and if they found them fifty miles off, across the desert, they would gather them up and bring them home.

INDIANS CAN BECOME CIVILIZED.

Q. You think if the Indians had the proper kind of treatment from the whites they would finally become civilized, and could be made good citizens?—A. I think so, sir, so far as you have any right to expect. I think it is pretty hard to handle some white people, but so far as you have the right to expect, I don't think there is any need of all these troubles—these constant outbreaks and wars; I don't think there is any need of it. This is my experience, sir, and the experience of others that I have talked with. I think General Crook entertains the same idea. I had a long talk with him about Indian matters.

CAUSES OF TROUBLE WITH THE INDIANS.

I think we could bring it right home to the Utah people. Kind as we have been, we have yet never had trouble with the Indians that we did not instigate by selling whisky, or by bad treatment; and, having the difficulties on hand, we had to whip them. I think they instigated them; and I am as confident as I am that I live, if you could get proper men to take possession of their property and be with them, men who feel an interest in them, and who wanted nothing more than the government agreed to give them, you could build up a pastoral influence with the Indian tribes in that great interior country that would give them considerable support in clothing and meats; and with a surplus of stock that would buy them all their luxuries. I don't think they would be a dollar's expense to the government after a few years, and you would gradually bring them to civilization; and if I undertook this wool business and this cattle business, I would fashion their wool before their eyes, if I could, and learn them how it is done—start little woolen mills, and spin and weave right there, and show them how these things are done, and why a white man lives so much more comfortably than they do; but, for the time being, let it go to the Army. In the mean time it ought, by all means, to go to the Army.

INDIANS FRIENDLY TO THE MORMONS.

Some few years ago, while in Washington, when Red Cloud was there in charge of General Sheridan, I was introduced to him as the Mormon Delegate from Utah. He said he was glad to see me. Then I referred to the emigration of the people, to the extent of fifty or sixty thousand, across the plains; emigrating, with their women and children, unarmed, here with their grievances, and of the marches, backward and forward, that, so far as I knew (I thought I did know), we had never had an agent killed or a bale of goods taken, except once, at Plum Creek, when my partner had quite an amount of goods taken. He thanked me for the indorsement of them, and he said that they had always tried to be kind to us, because we had treated them kindly; that we treated them kindly, and had not been inimical to them in any way. I have seen that interview printed within a year or two as an indorsement of the Indian, and showing that he was treated properly by us.

The CHAIRMAN. I heard about that myself.

The WITNESS. There was a little circumstance occurred here once, when Brigham Young was *ex-officio* superintendent of the Indians, which you know he was for years. He started a little colony of them down south on Corn Creek, and among other things he furnished to the Indians a wagon, a pair of mules, a set of harness, and a plow, harrow, and some seed and farming utensils. That man was fourteen or fifteen years getting that allowance. That took place in 1854, 1855, or 1856, and the accounts were finally paid in 1869.

INDIANS REGARD WORK AS DEGRADING.

By the CHAIRMAN:

Q. It is stated to us sometimes that the men refuse to work and consider it degrading, and that the women have to do it. Have you any difficulty in inducing the men to work with proper inducements?—A. Their tradition is to look upon work as degrading, so far as the men are concerned. The squaws are the most industrious and hard-laboring things on earth. They do the work, and the Indian buck does the hunting and sporting. I suppose, to a certain extent, that might be changed, but it would take a good while, probably, to bring it about fully.

"LONG TONGUE."

You remember the time they constructed those lines of telegraph; there was a great deal of apprehension about the Indians. Washeka, who is a noble red man, and who would be a noble white man if he were white, was here at the time these lines connected at Salt Lake, and I think he sent the fourth message that was sent over them. He was sent for and brought in and showed how it worked. They undertook to explain to him what it would do. He shook his head and could not comprehend it at all. They asked him where his people were. He said Devil's Gate, 350 miles away, on Sweetwater, somewhere thereabouts. He was asked if they could be found, and he said yes. They asked him what he wanted to say, and he dictated a message; it was taken down and was sent, and probably the next morning, within twenty-four hours, he was brought back, and the answer was read to him. He said, "That is true, for nobody else could have known," and he gave a tremendous big grunt, and he gave the name to the Western Union line—a name by which they have always known it since, viz, "Long Tongue." During the construction of the line the policy of the superintendent was to make presents to the Indians of hard tack, bacon, tobacco, blankets, and such things; they would be out on the war-path and would be hungry, and they would say, "If we could get to the telegraph station we would be all right"—fish, clothing, coffee, &c.; and the result was, I don't know of an instance where they ever cut a line; they would pillage and murder and steal horses, but they never cut those wires.

By the CHAIRMAN:

Q. One exception was the very one you mentioned of Plum Creek.—A. Yes, sir; that is the only case.

CHARLES H. HEMPSTEAD sworn and examined.

By the CHAIRMAN:

Question. We are inquiring into the propriety of transferring the management of the Indian Bureau from the Interior to the War Department.—Answer. I understand that.

Q. We would be pleased to hear from you in reference to the management of the Indians. Have you formed any opinion as to the propriety or impropriety of this contemplated change?—A. I have made up my mind certainly.

THE TRANSFER SHOULD BE MADE.

Q. Is that based mainly on the advantages of paying the money and other annuities, or is that opinion formed with a view to the future development of the Indians in civilization and Christianity?—A. That is what would be the result of it. There is no question in my mind but that it would be proper to transfer it to the Military Department. You have there the force and power of enforcing what you wish. At the same time you have the opportunity of granting such favors as they are entitled to, and that is very good.

By Mr. BOONE:

Q. Your idea seems to be that kind treatment is essential to the preservation of peace with these Indians, and also necessary for their development?—A. Certainly; unquestionably.

Q. You had some experience with the Army officers?—A. Yes, sir.

Q. And you have observed the management of the Indians under the civil policy?—A. Yes, sir; I have seen a good deal of it.

Q. I would like to ask you whether or not if Army officers were detailed as agents of the Indians they would give them that care and patience necessary to their development?—A. I think they would; that is, to the best of my opinion. It is my opinion they would.

Q. In addition to that, is it your opinion, from what you know of the methods of transportation and of the system of strict accountability to which the Army officers are held, that, from an economical point of view, it would be beneficial both to the Indians and to the government to transfer their management to the War Department?—A. Unquestionably. They have a hundred different ways of accomplishing this thing which the civilians have not, who are constantly in conflict with them.

By Mr. STEWART:

Q. Upon what do you base your opinion; that the Army officers would treat them more kindly, and be better adapted to the management of the Indians in the matter of kind treatment than the civilians?—A. I do not know how I can express that. He would have the same reasons that influence the civilians and others that never enter the civilians' mind. But I don't believe I can express myself fully. He would have the means of communicating directly in the military manner to bring supplies to him. I don't know whether that expresses it entirely or not.

TRANSPORTATION SURER UNDER THE MILITARY.

By the CHAIRMAN:

Q. Very frequently, in the examination of witnesses, we have found parties who thought it would be economical, for the government and for the Indians both, to have the bureau operated under the system which is practiced by the military.—A. It certainly would.

Q. But few have given any opinion that they are better men.—A. O, they are no better; they are the same.

Q. Do you consider them better as men or does the military make them better? Is that your idea?—A. Their whole course of life tends to that. I don't know whether I express myself clearly or not. I don't think I do.

CARLIN, NEV., *October* 25, 1878.

L. BEVIER sworn and examined.

By Mr. HOOKER:

Question. What is your position?—Answer. Farmer in charge of the Northwestern band of Shoshones.

ANNUITIES ISSUED TO THE SHOSHONES.

Q. What annuities do they receive?—A. Their annuities are $5,000 a year under the treaty of 1863; they have received this year only about $2,800—it may vary two or three hundred dollars either way. The annuities are disbursed by the agent, he using his discretion as to the agricultural implements and supplies to be furnished. No money is given them.

Q. Where were these supplies purchased?—A. I believe in San Francisco this year, for the States of California and Nevada.

Q. Who is the agent for this Northwestern band of Shoshones?—A. A. J. Barnes.

Q. Was he recently appointed?—A. No, sir; I think he has been in the service some three years.

Q. Where is he located?—A. Eighteen miles north of Wadsworth.

Q. What is the number of Northwestern Shoshones?—A. I cannot give you the exact number, but there are about fifteen hundred of each band.

Q. That makes three thousand in all?—A. Yes, sir; some estimate them at four thousand, but I think three thousand a full estimate.

Q. How does this band compare with the other band as to agriculture?—A. The other band is not so far advanced as this one in agriculture.

Q. They are stationed where?—A. One hundred miles north of Elko.

Q. Who is their agent?—A. John Howell.

Q. Was he recently appointed?—A. Yes, sir; some three or four weeks ago.

Q. Are these Indians that we see around here full blooded?—A. Yes, sir.

Q. Are there any whites mixed up with them?—A. Do you mean living with them?

Q. Intermarrying with them?—A. No, sir.

SHOSHONE INDIANS PEACEABLE.

Q. Do they live in peace with the surrounding people?—A. Yes, sir.

Q. You say there is a claim to this reservation that the Indians now occupy; what is the character of that claim?—A. Stock and cattle men claiming it under a superior title.

Q. You say that this particular tract of seven hundred and twenty acres was set aside by order of the President of the United States?—A. Yes, sir.

Q. And it is claimed by ranchmen and stockmen, who base their claim upon a superior title, do I understand?—A. Yes, sir.

Q. Do they claim to have acquired it under the homestead laws?—A. I do not know whether under the homestead law or not, but I think under the State University scrip.

Q. What was the date of the setting aside of the reservation for them?—A. I do not know, but I should think about in the year 1875 or 1876.

MATERIAL CONDITION OF THE SHOSHONE INDIANS.

Q. Do these Indians seem to exhibit a disposition to improve their condition?—A. Yes, sir. The Indian chief here owns his own wagon, horses, harness, plows, &c., in his own name and by his own right.

Q. How much of a family has this chief?—A. Three children and two wives.

Q. How is this tribe as to intelligence?—A. They are very intelligent.

Q. How do they compare with the other Indians?—A. They compare favorably with any Indians I ever saw.

Q. When was the last treaty made by the government with them?—A. In 1863.

Q. There has been no treaty with the government since then?—A. No, sir.

Q. And are all the annuities paid to them paid under that treaty?—A. Yes, sir; and in installments—in twenty installments.

Q. And does that treaty expire five years from now?—A. Yes, sir; I believe it expires in five years from now.

Q. And do I gather from your statement that you think these Indians may be self-sustaining?—A. Yes, sir. If they could receive their appropriation they would be self-sustaining in two years—that is, if they could count upon receiving their full annuity in such implements as the agent might, in his discretion, think best to furnish them with.

JNO. A. PALMER sworn and examined:

The WITNESS. I was ordered by the department, in the year 1872, to locate the Western Shoshone Indians somewhere on a farm near this point (Carlin, Nev.). I went to the land-office and located these lands; and I located the Indians here.

WHITES ATTEMPTING TO OUST THE INDIANS FROM THEIR LANDS.

By Mr. HOOKER:

Question. You refer to the land-office in this State, do you?—Answer. Yes, sir. And after locating them I went to work with them, and made a perfect success of the experiment, raising more grain than was raised on all the other reservations in Nevada. Recently, certain parties, who were large stock-men and cattle-dealers, finding that the Indians were detrimental to their interests, undertook, or rather are now attempting, to oust them from their homes. They have got homes; they have good buildings, good fences, good ditches, and plenty of stock, and as a class they are hard-working, industrious, and honest. These white men claim this land from the fact that the Indian agent in this State had done nothing to acquire the title to the lands after I had made my selection, and made it known verbally and by letter, which is on record in one form in the department at Washington. This agent did nothing whatever to secure this title; and these same white people are now bringing a suit to get possession of these lands. I was informed only the day before yesterday by Mr. Howe, agent near Elko, that a suit had been brought against Barnes, the agent, and Bevier, the clerk, for the possession of these lands, and that Bevier had told these whites that if they would dismiss the suit he would give possession. I met Commissioner Lyons and made this statement to him—about the same that I have just made to you. He told me to telegraph to the department at Washington and to write to Mr. Barstow, and I have done so.

Q. Who is Mr. Barstow?—A. A gentleman living at Providence, who, I was told, is a great friend of the Indians. I telegraphed the Commissioner that the Western Shoshones were about to be ousted from their farms, and that it was all a fraud. I told him to stay the proceedings and investigate. I also wrote that I had made this statement to Major Watkins, one of the Indian Commissioners, and that he assured me that he would attend to this matter; and so did Commissioner Lyons. A gentleman was sent here from Washington to attend to this matter.

As to my own responsibility as a witness before you, I would refer you to Senator Jones and Mr. Leland Stanford, of San Francisco. They will tell you who I am. I came here among the Indians in 1849; I am a "Forty-niner," and I lived with the Digger Indians about ten years.

By Mr. STEWART:

Q. The Indians here are now cultivating the soil, are they not?—A. Yes, sir; and they are good farmers.

Q. Do they desire to remain where they are?—A. Yes, sir; they want to remain where they are and keep their homes.

INDIANS OPPOSE THE TRANSFER AND CAN BE MADE SELF-SUSTAINING.

Q. What do they think about the transfer of the Indian Bureau from the Interior to the War Department?—A. They are opposed to it. Make this transfer, and I assure you that the Indians will scatter like deer. These Indians are self-sustaining. I offer to make a bond, and I am prepared to do so to any required amount, that these Indians could be made self-sustaining within one year from now, providing they received their full appropriation.

By Mr. HOOKER:

Q. They do not then, in your opinion, or in the opinion of the Indians themselves, want an agent either from the Interior or any other department, do they?—A. No, sir; they can support themselves, and will do so if they are permitted to have their just rights and claims. They are as good farmers as you will find anywhere.

By Mr. BOONE:

Q. You stated that if the management of the Indians was transferred to the War Department, the Indians would scatter like deer; did I not so understand you?—A. Yes, sir.

Q. Why would that result follow?—A. Because they are afraid of the soldiers.

Q. They think, then, that to transfer the Indian Bureau to the War Department would necessarily bring soldiers among them?—A. Yes, sir.

By Mr. STEWART:

Q. Suppose that no soldiers were brought here, but simply an Army officer were detailed to act as agent, what would be their feeling in that case?—A. It is my opinion that all they ask or require is to be let alone. If you will let them alone, they will get along all right.

PALACE HOTEL, SAN FRANCISCO.
October 28, 1878.

FRANK J. PARKER sworn and examined.

The WITNESS. The particular object of my coming to you was that I might be of some service if you went up in the northern country.

Mr. BOONE. We may not go up to that country, and we would like to have your statement.

By the CHAIRMAN:

Question. Where do you reside?—Answer. I reside at Boise City, Idaho.

Q. How long have you lived in Idaho?—A. Twelve years.

Q. What capacity have you been engaged in?—A. Mining and trading; scout, courier, and everything else in the service of the government for the last two years.

Q. During that time you have come in contact with the Indians there, and have had a general experience in their management?—A. Yes, sir.

Q. With what Indians have you come in contact?—A. Malheurs, Sioux, Sheepeaters, and, to some extent, with the Nez Percés. I have lived among the Nez Percés for six years steadily.

PRESENT MANAGEMENT OF THE INDIANS UNSATISFACTORY.

Q. Has the management been satisfactory to the Indians, as heretofore transacted and as transacted at present?—A. No, sir.

Q. Has it meted out justice to them?—A. No, sir.

Q. In what particular has it failed?—A. They have not made their payments to the Indians.

Q. Whose failure do you understand that to be—of the authorities at Washington or of the Indian agent?—A. Both the Indian Department and the agents.

Q. They have been very careless, and have not fulfilled their promises?—A. Yes, sir.

Q. What knowledge have you of that fact?—A. The knowledge that the Indians broke out on that ground.

Q. Was that so?—A. Yes, sir.

INSUFFICIENCY OF SUPPLIES THE CAUSE OF OUTBREAKS.

Q. Have you any knowledge yourself in relation to the matter? Can you speak of your own knowledge further than that the Indians say so? Have you seen anything that induces you to believe that they have not carried out the treaty stipulations?—A. I have been on the Malheur Agency on issue days when they issued rations, and I found they had but little flour and beef; not enough half to do them two days, much less a week.

Q. How much were they entitled to?—A. I don't know.

Q. Did not the agent complain that it had not been furnished him from Washington?—A. He complained that the appropriations were so cut down that he could not do it.

Q. And you think the trouble grows out of the fact that they are not provided for as they ought to be?—A. No, sir; the promises are not fulfilled; that is just exactly the cause. Indians are like children; if they are promised a thing, they expect you to perform it.

CAUSE OF NEZ PERCÉ WAR.

Q. Were you there when the Nez Percé war broke out?—A. I was there two weeks afterwards.

Q. If you have any knowledge as to what caused that war, state it. —A. Yes, sir; I think I have.

Q. What is it?—A. It was caused by the attempt to force them on the reservation—to take them from their land and force them on the reservation.

Q. Do you think that was right or wrong?—A. It was wrong. They were non-treaty Indians, and the government had no right to force them. They agreed to give them a reservation over on the Walla Walla Reserve, and the government tried to force them on their reservation. They claim this country as their right.

Q. As you understand it, they did not purchase this country from them?—A. No, sir; they tried to force them on the reservation, and the non-treaty portion of the Nez Percés, consisting of Joseph's and White Bird's band, rebelled. One portion of the Nez Percés complied with the requirements of the government and went on the reservation.

Q. From whom did the order to go on the reservation come, the military or civil department?—A. From the civil department. The military had to enforce the order.

Q. And that, you think, caused the war?—A. Yes, sir; decidedly so

THE TRANSFER SHOULD BE MADE.

Q. What do you think, would it be any better if those Indians were turned over to the Military Department than it is at present?—A. Well, sir, I am rather prejudiced in that respect, and, having prejudices, I would not like to give a reply.

Q. Please give an answer. That is what we desire.—A. It is the only thing that will settle the troubles.

Q. Would you want the military to have full power to manage them? —A. If they do not have full power, they cannot do anything.

Q. You think the military ought to have power to protect as well as to punish them?—A. They require protection as well as punishment.

Q. Protection from whom?—A. From the outside settlers. That is

where the trouble comes from. Will you let me say something about the Umatilla Reservation?

Q. We want to get your reasons for thinking that it would be better to turn the management of the Indian Bureau over to the Military Department. You say you think it would be better to give the military power to punish as well as to do the clerical business and feed them. And you say that you want them protected against the settlers. Do the settlers incline to impose upon them?—A. Decidedly so, sir.

WHITES DESIRE TO GET THE INDIAN LANDS.

Q. Do they fight them?—A. They want their lands. They have fine grazing and herding lands in every direction. They are killing the Indians whenever they can get them out. I saw an Indian lying dead the other day with twelve bullets through him.

Q. To what tribe did that Indian belong?—A. To the Umatillas.

Q. How far is the Umatilla Reservation from Boise City?—A. Two hundred and fifty miles.

Q. Is it in Oregon?—A. Yes, sir.

Q. What do you know about them?—A. I have been there frequently, as everywhere else.

Q. Have those Indians not been friendly?—A. This year they have been on the fence.

Q. Do they want the military to manage their affairs?—A. If the military does not they will retaliate and blood will flow.

Q. Retaliate for what?—A. It is the sacred law of the Indian's nature, and he will retaliate for these abuses by the whites.

Q. How will you stop them?—A. By turning them over to the military and giving power to punish for these depredations.

Q. You would not take the law from the civil authorities entirely and give it to the military, would you?—A. Most decidedly, for the civil authorities will not do that.

Q. Then your courts do not amount to anything there?—A. No, sir.

By Mr. STEWART:

Q. Have you had any experience among the semi-civilized Indians?—A. The Nez Percés.

Q. I mean those that have adopted the habits and customs of the whites.—A. I have been among the Nez Percés.

Q. Are they an agricultural people?—A. Some of them raise fine grain, and they can read and write.

Q. How is it among the Indian tribes of Wisconsin, Minnesota, and the Indian Territory?—A. I don't know anything about them, except what I have heard.

Q. You would put them all under the military?—A. When they are getting along by themselves leave them where they are. I am talking about these coast Indians.

By the CHAIRMAN:

Q. How far have the Umatillas advanced in civilization?—A. They have their little farms and raise vegetables.

Q. Are they not considered quite rich in stock?—A. In horses and cattle they are.

Q. Do you know about the number of horses?—A. I should think there were about ten or twelve thousand horses. I am not sure.

Q. To how many Indians?—A. They ought to number about three hundred and fifty warriors.

Q. A thousand or such a matter in the tribe?—A. I should say fifteen hundred or two thousand.

Q. Would they not, if left alone, be able to take care of themselves; that is, if the whites were prevented from imposing upon them?—A. The whites surround them.

Q. Suppose the whites were punished by the civil authority for imposing upon the Indians, could not the Indians take care of themselves and support themselves? Would they not be able to live without the government's aid?—A. If they would work they could. They have the best lands in that part of the country.

INDIANS AVOID LABOR.

Q. Why will not the Indians work?—A. Indians will not work if they can help it. They are like a great many white people in that respect.

By Mr. BOONE:

Q. You said that there was a great deal of complaint about the supplies not being furnished to the Indians as due to them, as they believed?—A. Yes, sir.

Q. That complaint comes from the Indians themselves, does it?—A. Yes, sir.

Q. You state also that you had seen rations issued to them that were intended for a week that you did not think sufficient for more than two days?—A. Yes, sir.

Q. Did you state the agent claimed that the appropriations were so small that he could not issue any more?—A. That is what he said; yes, sir.

Q. And he gave that as a reason for not giving full rations?—A. That was his reason.

Q. He acknowledged, did he, that they did not have their full rations, according to what they were entitled to; not sufficient to do them a week?—A. That was it. The appropriation at first was fifty thousand dollars. It is now twenty thousand dollars. He says he has no money to buy beef. They certainly had but one beef for a whole week. The time I was there they only killed one beef for three hundred.

Q. Who was the agent then?—A. A man by the name of Rhinehart.

Q. Is that in Idaho?—A. In Eastern Oregon.

Q. What Indians are you speaking of?—A. They go by the name of Piutes, Malheurs, and Snakes.

Q. Are they all the same kind of Indians?—A. Yes, sir; they are from a common tribe.

Q. Branches from the Piute tribe?—A. Yes, sir.

Q. Is Mr. Rhinehart agent at present?—A. It is all busted up.

Q. What do you mean by that?—A. The Indians left the reservation, and they went to fighting, and they are now prisoners.

Q. Is Rhinehart there?—A. At Canyon City.

Q. Where is that?—A. Oregon.

ARMY OFFICERS PREFERABLE AS AGENTS.

Q. Supposing the management of the Indians was turned over to the War Department, and officers of the Army were detailed to act as agents, how do you think they would compare with civil agents whom you have seen controlling Indian affairs?—A. I think they would compare very favorably.

Q. What reasons have you for so thinking?—A. Army officers have a steady thing. They have their honor to look after, and they dare not

disgrace themselves by stealing like a civilian. He has to steal all he can to make his "pile" in the shortest space of time.

Q. You think the main object is to make the "pile" as soon as possible?—A. Yes, sir. How can a civil agent live on $1,200 a year and keep his family out in that country?

Q. How long have you been a scout?—A. Two years.

Q. In what region of the country?—A. From Oregon to the Yellowstone.

Q. A scout for whom?—A. General Howard. In the Army generally—not particularly for him but for every one.

Q. What were you doing before becoming a scout?—A. Mining.

Q. Where?—A. In Idaho.

Q. How long were you engaged at that?—A. Ever since I have been on the coast.

Q. How long have you been on the coast?—A. Since 1864. I was in Arizona before that.

Q. Are you a married man?—A. No, sir.

Q. What tribes of Indians have you been most among and know most about?—A. Nez Percés, Piutes, and Bannocks.

AGRICULTURE AMONG THE INDIANS.

Q. Are the Bannocks engaged in agriculture?—A. Very little.

Q. The Piutes at all?—A. Very little.

Q. The Nez Percés, you say, cultivate some?—A. They cultivate considerable land and raise all kinds of grain, watermelons, potatoes, and such like. On half the land the fences are broken down and the houses dilapidated.

INDIANS NEED PROTECTION.

Q. You think that the Indians need protection from the outside settlers?—A. Yes, sir.

Q. Have the settlers been encroaching upon them and defrauding them?—A. Yes, sir.

Q. In what respect?—A. Killing them and stealing their horses.

Q. And you stated that the Indian needs protection as well as punishment?—A. Most decidedly.

Q. And you think, therefore, if they were justly dealt by, and we gave them all they are entitled to, and they were protected, that we would have no more difficulties with them?—A. Most decidedly.

Q. Are they disposed to be friendly?—A. Very much so.

Q. Don't they commit murders sometimes on the white people?—A. Not unless matters are forced upon them. I never carried a gun until the last two years, except when hunting. The Nez Percés made it their boast, until this last outbreak, that they had never killed a white man. It was their proudest boast until this last outbreak.

IRREGULARITIES AT THE LEMHI AGENCY.

Q. In regard to the Lemhi Agency, what do you know about that?—A. I have been there and know what citizens told me.

Q. Who is the agent there?—A. Mr. Fuller.

Q. Do you personally know Mr. Fuller?—A. No, sir.

Q. Do you know, personally, that he ever took anything which didn't belong to him?—A. I know this much, that goods were seized in a box, and he was hauled up for it, but they let him go. It was supposed to have been his clerk who did this.

Q. Why did they let him go?—A. Simply because it was too much trouble to prosecute him. They found dry goods and hides in this box,

which he was trying to ship away. As to the rising of Tenday and his band, he was on the Lemhi Reservation this summer when this Bannock war broke out. It was supposed they were going to join the Bannocks.

Q. That was simply hearsay?—A. I know it was so, because I know when a man is telling the truth.

Q. What you know about these goods is simply hearsay?—A. Mostly so. Yes, sir; but I can make an affidavit, if necessary.

Q. Have you anything else you wish to say to the committee?—A. In regard to Moses's band. If there is an attempt to force them back, and not give them what General Howard promises them, there will be the bloodiest war this country ever saw.

Q. What tribe do they belong to?—A. Spokanes, or Columbias. They take in the whole of the country from the range to the Columbia River. If there is an attempt to take their lands, there will be the bloodiest war that ever took place. They number eighteen hundred well-armed warriors. They are furnished with the latest improved rifles, horses, and munitions. If there is an attempt to force them from the land Howard promised them, they will break out. They are just waiting for the signal to break out. This land is of no use to the whites.

Q. Are they treaty Indians?—A. No, sir.

Q. The white people you speak of as encroaching upon the Indians, are they citizens or interlopers?—A. Everybody is supposed to be a citizen; principally horse-thieves. They have scrip to locate upon the Indian lands. They have scrip and will float upon it as soon as the Indians are driven out. They wish to drive the Indians to a corner, and get the military to punish them, and have the lands thrown open to market, and they have the places all picked out.

WHITES TRYING TO PROVOKE A WAR WITH THE INDIANS.

Q. You think they are trying to provoke a war with the Indians?—A. Most decidedly so.

Q. For the purpose of locating the scrip upon the land?—A. Yes, sir; and they will immediately take it.

Q. That is your idea?—A. That is what they will do. They have the places all picked out, that is, the land of the Umatillas. This land of Moses's don't amount to anything—hardly worth cultivating, except one or two little spots. Outside of them it is generally bare and rocky and craggy and hilly, bounding on the Columbia River. The first attempt to put these Indians on the reserve will be a signal for bloody work.

Q. Do you know anything about the Indians in this State—California?—A. No, sir.

Q. Nothing at all?—A. No, sir; nothing at all.

GEORGE H. HENLEY sworn and examined.

By the CHAIRMAN:

Question. How long have you been in this country?—Answer. Since 1853.

Q. You have had some relations, as I understand, with the Indian Department?—A. Yes, sir.

Q. Please state to the committee what those relations were—what part you have taken in the matter.—A. My father was superintendent of Indian affairs for California from 1854 until 1860, and during that time I learned a great deal about the service. I visited a good many reservations and was a good deal among the Indians, and have become somewht familiar with Indian affairs both in connection with the serv-

ice and otherwise. Since 1860 I have resided in the vicinity of Round Valley Reservation, and have known all the time of the condition of the Indians in this northern section of the State; that is, in several counties—Sonomo, Humboldt, Trinity, Tehama, Plumas, and Butte Counties, and that region of country.

Q. How far is that reservation from this city?—A. About one hundred and ninety miles.

Q. What is the extent of the reservation in acres?—A. It embraces one hundred and eight thousand and some odd acres.

Q. What number of Indians are living there at the present time?—A. I don't think they will number two hundred and fifty to-day.

Q. They confine themselves to the reservation, do they not; that is, they are all on the reservation?—A. Not exactly. They go off the reservation to work. They find employment among citizens, and do a great deal of work off the reservation.

Q. They will work if they can get pay for it?—A. Yes, sir; they are good work-hands.

INDIAN WEALTH.

Q. Are they making efforts to accumulate property and to sustain themselves?—A. They don't lay up much property; they earn a good deal of money and have a good deal of money, but they lay it out as fast as they get it. Horses are about all they care for in the way of accumulating property.

Q. Do you suggest any change or any improvement in the management or treatment of these Indians?—A. Yes, sir; I will tell you what I think about it.

Q. We will be glad to have your opinion.—A. And I will also tell you what the Indians themselves desire. I will go back to the time when the majority of the Indians now in this reservation were brought there.

By Mr. HOOKER:

Q. What tribes are they?—A. They have no names; they are designated by locality; the Pitt River tribe, for instance. Only a few of these are left—perhaps thirty or forty.

By the CHAIRMAN:

Q. Were they not, originally, located with some of the tribes in this country?—A. No, sir. They have no name; they are designated by locality.

Q. What others?—A. A remnant of the Cancows came from Butte County, on the Sacramento River. The balance came from Mendocino County, and are designated Ukie and Little Lake Indians. In 1872 there were few Indians on the Round Valley Reservation, and at that time there was a military post there. Our people, in different sections of the country, had agitated the question of the removal of the Indians; and they sent out the military, who collected the Indians in Mendocino County and brought them on the reservation. I think they got as many as fifteen hundred.

INDIANS AVERSE TO RESERVATIONS.

By Mr. HOOKER:

Q. When was that?—A. Eighteen hundred and seventy-two. The Indians they brought in there had been before that making their living among farmers and ranchmen. They were good work-hands, and understood all about farming and working timber, and their services were in demand, and they had supported themselves. They were not satisfied with their condition on the reservation, and they gradually worked

back to where they came from. They have kept going, although we have at different times gone and brought them back again. Still, they prefer to support themselves and live on their own reserves—their own lands. Within the last sixty or ninety days about two hundred and fifty have left the reservation and gone down about Ukiah City to buy lands for themselves, intending to remain away permanently. The Indians say all they want is the privilege of providing for themselves—living by their own labor.

By the CHAIRMAN:

Q. They do not desire to have any agent?—A. They ask no favors of the government. All they want is the privilege of taking care of themselves.

Q. What do they think about transferring the bureau from the Interior to the War Department?—A. They do not want either. These Indians want to be treated just the same as other people. They are perfectly peaceful and quiet, and as well behaved as any class.

Q. Do they use the English language?—A. All except the old ones.

Q. Do they dress in citizen's clothing?—A. They are better dressed than anybody else in that country; that is, of their class of people.

Q. They are, I should judge from your remarks, gradually dying out?—A. Yes, sir; they are very rapidly passing away.

INDIANS CAN PROVIDE FOR THEMSELVES.

Q. Would anything avert that—any course of management that might be put forth by the government; is there any condition in which they could be placed where they would increase and grow up as a people?—A. I don't know. I don't see any reason why they should not, except when Indians come in contact with civilization they disappear. I cannot understand why it should be so, but it is the case. In my opinion it is very difficult to determine properly what should be done with these Indians. I think there is no sort of necessity for keeping up the reservation and expending a large amount of money for employés, and all that sort of thing, when the Indians don't want or ask anything of the kind, and they can provide just as good living for themselves as the white employés on the reservation can provide for themselves. Turn them loose on their own responsibility; that is what they want. I think this: that it would be, perhaps, as little as the government ought to do for the Indians who want to stay on the reservation to divide up the lands and give them all they would require to cultivate to raise crops to support themselves with. Give it to them in trust, so it cannot be alienated, and let them take care of themselves. And it might be well, if any number of them should choose to remain there, for the government to provide schools. Under the laws of this State they are entitled to all the benefits from the school fund. Though they might not get the benefit from them that they deserve, yet it might be policy on the part of the government to establish schools for them under such circumstances. One school is all they have on that reservation now, and, of course, one would be sufficient. It is at the present time so considered.

Q. Do they live close enough together to permit one school to answer for all?—A. Yes, sir; they had two schools last year, although I have been told one school was sufficient for all.

LAND SHOULD BE HELD IN TRUST FOR THE INDIANS.

Q. To sum up, if I understand you, you think the government should set apart as much lands as they ought to have, hold it for them in trust, so as to be inalienable, and that they should be allowed to take care of

themselves, work for themselves, and manage their own affairs in their own way, and without any agent?—A. Yes, sir.

Q. And you think no agent is necessary from either department to manage them?—A. No, sir; it might be a question whether or not an agent, or some one should look after their interests, was necessary.

Q. A farmer, or something of that sort?—A. Some one with authority to lookafter their interests and general welfare. In Lake County and Ukiah City they seem to get along as well as anybody. They are able to enforce their contracts, and they seem to be dealt with fairly, and seem to have no difficulty on that account at all. They very seldom have any litigation. If the Indians work for a man and he doesn't do as he agrees to, and pay them promptly, they will not engage with that man again. I employ a good many of them myself, and I find them good hands. I suppose we pay as much as three thousand dollars a year to Indians.

Q. You are a farmer?—A. Yes, sir; I am engaged in farming and stock-raising.

Q. You think them trusty and faithful hands?—A. They are very good hands. Of course there are exceptions among them. One Indian we have had in our employ about ten years; we pay him twenty-five dollars a month, besides rations for himself and squaw and family of two children.

INDIAN COMPETITION IN THE LABOR MARKET.

By Mr. BOONE:

Q. It is your idea to allow them to go wherever they can get employment, or choose to go, rather than to keep them by force on the reservation?—A. Yes, sir; that is what the Indians desire themselves; so the people desire, except a few, perhaps. To show you just what the feeling is sometimes in regard to that affair, I will say that in the year 1872, the time these Indians were taken to that reservation, at one place, called Middle Lake Valley, in Mendocino County, the people there (I suppose the majority, I don't know, but I suppose so) wanted the Indians removed and taken away. Well, the people got together to compel the Indians to go on the reserves. The white people brought them up there themselves. I interrogated the parties who came up there, and found out the reason, and the whole trouble was that the Indians came in competition with the whites in the labor market. And one fellow, a German, said a white man could not get a day's work, that the Indians worked cheaper; that they were not going to have the Indians there. That seemed to be the whole difficulty.

STOCK-RAISING AND AGRICULTURE.

Q. What pursuit do they seem to prefer, stock-raising or farming; do they seem to take to stock-raising and dealing in cattle with more pleasure than farming?—A. Some of them would like to work on the farm better than any other way. The active fellows who have a great deal of energy like the stock business best. Others who are duller say they prefer farm labor.

Q. Pretty much like the white people in that respect?—A. Yes, sir. A great many of the people are incompetent to become stock-raisers, the same as among the white people. It is the same with the Indians as with your whites, as far as their condition in that respect is concerned. I don't notice any difference between them and the whites.

EDUCATION.

Q. Do they have much anxiety to have their children receive an education?—A. Yes, sir; but they don't seem to have as much anxiety about that as they ought to.

Q. Do they have as much anxiety in that respect as the white people?—A. Not as much as when the schools were first established there. It was a novel thing at first; they took a great deal of interest in it. As soon as the novelty wore off they didn't care much for it. On the reserve they have a great deal of trouble in keeping them in the school.

Mr. HOOKER:

Q. When was this Round Valley Reservation established; by what treaty?—A. No treaty.

Q. How was the reservation established?—A. It was set apart as a reservation, selected for Indian purposes, in 1856.

Q. By executive order?—A. By the superintendent of Indian affairs, and the selection was approved by the proper officer—I do not know whether the Commissioner, or not.

Q. Was your father then superintendent?—A. Yes, sir.

Q. It embraces an area of 108,000 acres?—A. Yes, sir. When it was first located in 1856 a small portion of this valley was selected for an Indian farm, and was attached to Nomelackee Indian Reservation in the Sacramento Valley. It was the purpose to remove them from there to Nomelackee Reservation.

Q. How was it extended?—A. Afterward, in 1859, the Commissioner issued an order to set apart the whole of Round Valley for Indian purposes.

Q. The Commissioner of Indian Affairs issued the order?—A. Yes, sir. As the settlers before that time went in there and located upon the lands, there was a controversy about it until 1873, when an act was passed restoring a part of Round Valley for settlement and extending their reservation north.

Q. That act embraced the 108,000 acres?—A. Yes, sir.

Q. When was that, in 1873?—A. Yes, sir.

Q. Are there any annuities paid to these Indians?—A. No, sir.

Q. Any money or rations, or anything else?—A. No, sir. There has never been any treaty with them.

Q. What is the number of children in the school?—A. I was told by the ex-teacher that they have about forty.

Q. They have got a farmer and a carpenter and a blacksmith among the civil employés in that agency?—A. I have got a list of employés.

Q. Read it.

List of employés Round Valley Reservation, July 1, 1877, to July 1, 1878.

Agent, salary	$1,500 per annum.
1. Physician, salary	1,200 per annum.
2. Farmer, salary	1,000 per annum.
3. Blacksmith, salary	1,000 per annum.
4. Clerk, salary	1,000 per annum.
5. Miller (grist), salary	1,000 per annum.
6. Sawyer (saw-mills), salary	900 per annum.
7. Hop-raiser, salary	900 per annum.
8. Teacher, salary	800 per annum.
9. Herdsman, salary	800 per annum.
10. Assistant teacher, salary	700 per annum.
11. Hospital steward, salary	700 per annum.

Q. Who is the agent?—A. H. B. Sheldon.

Q. What is his salary?—A. Fifteen hundred dollars per annum.

Q. That comprises the civil employés up to July, 1878?—A. Since then the force has been reduced, and salaries also.

Q. What reduction of salaries?—A. The salaries as reduced are as follows:

List of employés and salaries from July 1, 1878, to present time.

1.	H. B. Sheldon, agent	$1,500
2.	S. J. Reed, physician	1,000
3.	J. W. Adams, clerk	900
4.	B. Handy, farmer	840
5.	G. B. Hopper, blacksmith	840
6.	C. M. Brown, sawyer	840
7.	N. S. Fanning, miller (temporarily)	720
8.	D. B. Cummings, teacher	720
9.	J. G. Short, hop-raiser	720
10.	Joel W. Vann, herdsman	600

Q. At the time this reduction took place, how many Indians were on the reserve to be benefited by the various people in these departments?—A. Between 450 and 500, I think.

Q. Didn't I understand you to say a while ago that you had been recently up by the reservation?—A. Yes, sir.

Q. What number are there now?—A. I should estimate the number not to exceed 250.

Q. How many pupils in the schools?—A. I was told a few days before I left there by a man who formerly taught that there were about forty pupils altogether.

Q. How are the teachers paid?—A. I don't know that, but I think out of the appropriation.

Q. Out of a general appropriation for Indian purposes?—A. Yes, sir.

DISPUTED TITLE TO INDIAN LANDS.

Q. Is there any disposition on the part of the whites living in the neighborhood of this reservation to encroach upon it and take the lands from the Indians?—A. Perhaps I had better not make a statement.

Q. Answer the question and make any statement you wish to.—A. In 1873, when this act was passed, restoring part of the Round Valley Indian Reservation to public lands, and extending the reservation, the extension embraced lands, a large amount of them occupied by settlers. The act provided for the appointment of commissioners to appraise the lands of the settlers, and also, when the settlers were paid, or tendered the amounts of the improvements, they were to remove from the reservation. Some of the settlers were dissatisfied with the appraisements, and refused to accept the tender, though the tender was made to only a few of them outside of the valley lands and hilly lands, called grazing lands. They refused to accept the tender, and they are still on the reserve just as they were before. The balance of the settlers have never had any tender made to them. They tendered payment to only about nine of the settlers, I think, and the balance of them of about—well, I should say forty—they never tendered any money to.

THE WHITES RESPECT THE RIGHTS OF THE INDIANS.

Q. Is there any tendency on the part of the people living in the neighborhood of the reserve to take possession of the lands?—A. In violation of the rights of the Indians?

Q. Yes, sir.—A. No, sir.

Q. They are willing to respect the rights of the Indians as assigned under this law of 1873?—A. Yes, sir.

Q. How many Indians are there in families who receive the benefits of the various officers—the farmer, blacksmith, carpenter, physician, and all the others you have mentioned? How many families of Indians on

the reservation are there to be benefited by keeping up this civil list of servants?—A. I cannot tell the number of families.

Q. Approximate the number of Indians.—A. The number of Indians now there I estimate at about two hundred and fifty.

Q. What is the area of lands under cultivation—arable lands?—A. They have got about four thousand acres of arable lands.

Q. You do not mean in cultivation?—A. No, sir; not all in cultivation.

AGRICULTURE AT THE ROUND VALLEY RESERVATION.

Q. What is the number of acres actually in cultivation? Approximate as nearly as you can.—A. I should think about sixteen hundred acres as near as I can guess. I might say this to the commission, some of the very best lands they have on the reservation are overgrown with willows and underbrush of that character, and they don't clear them off; one reason they don't do it, I think, is they have not the appliances necessary.

Q. How are they supplied with agricultural implements?—A. Very well.

Q. How are they supplied?—A. By general appropriation.

Q. Not by any annuities due these Indians under treaties?—A. No, sir.

Q. Who purchases these farmers' supplies?—A. The purchases were made this fall by some one who comes from Washington.

Q. Where were the purchases made?—A. In this city.

Q. How far is this reservation from this city?—A. One hundred and ninety miles.

Q. How do you go to it?—A. By rail to Clover Dale, and from there by stage.

Q. How far by stage?—A. Ninety miles.

By Mr. BOONE:

Q. Are there any other Indians in California?—A. Yes, sir.

Q. Where are they located?—A. They are scattered all over the State; in almost every county there are some.

Q. Are there any other reservations than this?—A. No, sir; none that are carried on as reservations but this.

Q. Are there any other agents?—A. No, sir. Hoopa Valley is called a reservation, but is not carried on as a reservation.

Q. There is no agent there?—A. No, sir; it was abandoned two years ago. The idea was to abandon that reservation, and remove the Indians to Round Valley. The then agent abandoned it, and sold most of the property except a portion they removed to Round Valley; and they even sold provisions that had been stored there for the Indians, and tried to force the Indians to go to the Round Valley reservation, but they refused to do so, and are still there.

Q. The Indians in California, aside from those on that reservation, are scattered about in different parts of the State?—A. Yes, sir. In Sacramento Valley they work on the ranches and get paid the same as other people do.

By the CHAIRMAN:

Q. Do you know whether these Indians are taxed the same as other people or not?—A. Yes, sir; they are if they have property.

Q. Do you know of a certainty whether this money is paid by the government for school purposes or whether it is paid by the State government?—A. It is paid by the government for the schools on the reservations.

Q. I have heard they had a State fund.—A. They are entitled to the benefits of education under our laws; the Indian people are entitled to the same advantages as other people.

INDIANS DESIRE TO BECOME INDEPENDENT.

By Mr. STEWART:

Q. You think if the government withdrew its aid, and endowed them with the rights of citizens, that would be satisfactory to the Indians and to the people of the State?—A. Yes, sir; it would be entirely satisfactory, and the Indians would be better off than they are now.

By the CHAIRMAN:

Q. Have you anything further to state to the commission?—A. According to my judgment that would be a solution of the whole question so far as the Indians in this State are concerned. There are very few of them; they are perfectly capable of making a living for themselves; there are a good many old and infirm Indians that ought to be cared for in some way. The great trouble in doing anything for them is the example. On Round Valley Reservation they ought to have a hospital. When the troops were removed from Camp Wright they had everything in good shape; and the agent thought he would establish an hospital and treat the infirm. They did so, and employed a white lady to take care of them—a person who took an interest in it—and when the Indians got sick they were removed to the hospital, but still they were not satisfied with that; they did not want to go there. When they found they had to go to the hospital when sick, they would not report, but they would take their sick up in the mountains to avoid going there. They prefer to be right in the camp among their people and live as their people live, rather than go to the hospital where they could be taken care of. This is one of the difficulties. I have seen Indians leave the reservation, have met them on the road—very old Indians; saw one old grandmother on a horse with blankets in front of her, and she was perfectly helpless; she had a rope tied around her body and around the saddle. I stopped to watch the Indian leading the horse. She would lean over, and almost fall off on one side, and the Indian would straighten her up and then he would lead the horse a little ways, and then she would commence falling off again, but he would straighten her up again. It shows what an anxiety they have to go back where they were raised and live among their own people. When their people go anywhere they want to go with them.

On our farm we employ regularly about eight or ten, and at times as many as twelve or fourteen. The balance of them over there are mostly old men and squaws, and some live there that we do not want there at all. I have tried to get them away, but I have found that I could not without abusing them and forcing them to leave, and so I let them remain. We give them all the land they want to cultivate; land is not so valuable there as in the vicinity of San Francisco. We can afford to give them all they want to use for themselves, and they prefer to live in that way; and the old ones prefer to live there in that way by what they can pick up rather than to go on the reservation and be provided for there. We don't want any more Indians around us than we already have; we cannot keep them away without forcing and abusing them, and I don't care to do that.

PALACE HOTEL, SAN FRANCISCO, CAL.,
October 28, 1878—7.30 p. m.

C. F. JUILLIRD sworn and examined.

By the CHAIRMAN:

Question. How long have you lived in this section?—Answer. Twenty-odd years. I came here in the spring of 1850.

Q. Have you had any official connection with the Indian Department?—A. None whatever.

Q. Have you ever had any acquaintance with the Indians?—A. I cannot say that I have, though slightly, but I have observed more or less, and I used to think the management was not what it should be.

Q. What Indians are you best acquainted with?—A. In the early days I landed in San Francisco; and I shipped to Trinidad Bay, above here. There were forty-five of us started in that crowd—everything on our backs. We met a good many Indians through that country on our route; we went through what is called Hoopa Valley Reservation. There must have been at that time in the neighborhood from one to three thousand Indians, although I am not very positive about that. There were three villages built well of this redwood; boards as high as eighteen feet, with covering of split boards. They were quite comfortable quarters. They seemed to have any quantity of supplies, such as venison, salmon, and different seeds and different fruits. They were very friendly. There was one party which arrived there some two weeks before us, and they got scattered around the country, and one fellow was lost from the company. He was missing for over two weeks before we found him. They had taken care of and fed him. They were quite hospitable in their way.

Q. At that time they were what are called blanket Indians, not civilized?—A. Not civilized then; they were in their original condition.

THE INDIANS' CONDITION IN CALIFORNIA WORSE TO-DAY THAN IN 1850.

Q. How do these Indians stand to-day? Any improvement among them?—A. I think it is the reverse—much worse than they were at that time.

Q. You think there has been no effort put forth to better their condition?—A. No, sir. The reservation established there by the government has a great many settlers around it. I believe there was some attempt made to cultivate the land, but they did not succeed.

Q. What number of Indians live there now?—A. I don't think more than one third of what they were originally; and what few are left were gathered from the surrounding country at various times. The State of California organized the forces under the militia system and drove them in that valley from Trinidad and Humboldt Counties.

Q. Are they drawing any annuities from the government?—A. I don't know. I think they are, but I don't know.

Q. What Indians are you talking about?—A. The Hoopa Valley Indians. The Indians on that reservation were composed of Indians from three different counties; Del Norte and Humboldt principally.

Q. Please point out any change that could be made, or do they need any aid from the government in any way?—A. I don't know that I could make any suggestion. I have not been there for a number of years.

Q. You have not seen them for some length of time?—A. No, sir.

Q. You do not know at present whether they are dissatisfied with their management or not?—A. Personally I don't know.

Q. If you have anything that would connect itself with the present in any way we would like to hear it.—A. I cannot say anything about the present. I have not been in that part of the country for fifteen years. What I could say would simply be hearsay and that would not be evidence.

ANY CHANGE WOULD BE FOR THE BETTER.

By Mr. McCREERY:

Q. Do you think it would be advisable to transfer the management of the Indians from the Interior to the War Department?—A. I have made up my mind long ago that it could not be any worse than it now is. If there were any change it would be for the better, according to the best of my knowledge.

By Mr. BOONE:

Q. Did I understand you to say that the condition of these Indians, of whom you have been speaking, is not as good to-day as it was in 1850?—A. Yes, sir.

INDIANS WORSE OFF TO-DAY THAN IN 1850.

Q. They have retrograded rather than advanced?—A. Yes, sir. They are not in as good condition as they were in 1850, 1851, and 1852. At that time there were plenty of fish in the rivers, and a great deal of various kinds of game and food throughout the country. They have all been destroyed by the settlers about the reservation where these Indians are now. The fish have been destroyed in the working of the mines to a great extent. There are a great many settlers around there in these valleys, and the best land is occupied by what we call rancheros in this country, raising stock, &c. They are all more or less hunters and kill all the game they can. The Indians get it but rarely.

By the CHAIRMAN:

Q. You think in point of material for living on, &c., that they are in a worse condition now than they were then?—A. Much worse.

Q. Would they not have been able, if properly managed, by this time to take care of themselves just the same as the white people?—A. I think so; if they had been properly managed.

Q. You think it is simply the want of proper management?—A. I think so, sir.

INDIANS CAPABLE OF SELF-SUPPORT.

Q. Do you think the War Department would be able to do any more in the way of training them in the way of husbandry?—A. I will state what I know of from my own observation, and from others stating what they saw going on at that reservation. When they first started, these Indians were supplied with the necessary seeds and implements to cultivate the ground. They went on for a year or so. I was told by a person of veracity, as I thought, that most of the products were sold to the miners. We were then keeping store in the mines at the time the reservation was established. I bought at one time sixty or seventy thousand pounds of flour, and I was told it was from the corn and wheat the Indians had raised, and that it had been purchased from the Indians; yet, but a short time after that, they were in a starving condition. I believe if they had been managed properly, as it was intended by the government that they should be, that they would have been brought up to a state of civilization, and able to sustain themselves at that time.

Q. Are you acquainted with the agent?—A. I am not.

Q. Have you been acquainted with agents in years past?—A. Yes, sir.

Q. How long since?—A. Fifteen or eighteen years.

Q. Not within the last four or five years?—A. No, sir.

By Mr. HOOKER:

Q. I want to know whether you are acquainted with the character of the land reserved for these Indians?—A. I am.

Q. What is it?—A. Very good, and productive.

Q. Good arable land?—A. Yes, sir.

Q. Capable of yielding as other lands in California?—A. Yes, sir; it will yield very well. It has been occupied by settlers. At one time the settlers were partly bought out by the government. This was settled by settlers at the time it was established as a reservation; most of the land was in a flourishing condition, but they had no title to it.

WHITES ENCOURAGE THE INDIANS IN LEAVING THE RESERVATIONS.

Q. How do you explain the fact that the Indians are disposed to leave the reservation and go elsewhere for employment?—A. They are encouraged to a great extent by the settlers surrounding them.

Q. That is the reason why they leave the reservation?—A. I think so.

Q. In point of fact is not a large portion of this reservation occupied by white settlers?—A. Yes, sir.

Q. Do you know of any other malappropriation of the funds of the government by agents other than those you have just spoken of?—A. I do not.

Q. Is there not kept upon their reservation an Indian agent at a salary of $1,500 a year, and a physician, farmer, wagon-maker, blacksmith, &c., such as are usually kept upon a reservation?—A. It is so reported. I don't know of my own knowledge. I have not been there for many years, but I believe that is the case.

Q. You refer to—— A. Hoopa Valley Reservation.

Q. And yet notwithstanding the fact that there are very few Indians there?—A. At times, in the winter, there are a great many Indians there, but in the summer they manage to get away from the valley, and go in the mountains hunting. It is so reported by settlers living about there.

Q. You are not now speaking of the reservation?—A. I am speaking of Hoopa Valley.

Q. What is the extent of that?—A. Extent of the arable land?

Q. Of the whole reservation?—A. I cannot state.

Q. Approximate.—A. I cannot say what was set aside. It is the best valley in the whole of Trinity County. It will average, perhaps, 15 to 20 miles long, with a width from 6 to 8 miles.

Q. That constitutes the best portion of the reservation?—A. That is the best portion of Trinity County in a body.

By Mr. STEWART:

Q. Do I understand you to say that there was an agent and other employés at that agency?—A. I so understood it.

Mr. STEWART. I understand from Mr. Henley that it was abandoned two years ago.

G. W. WHITMAN sworn and examined.

By the CHAIRMAN:

Question. How long have you lived in this country?—Answer. Since 1850.

Q. Have you been more or less acquainted with Indians and their management in this country?—A. I am not particularly acquainted with the method in which they have been managed on their reservations. The first six or seven years after my coming here I was engaged in mining, and in the vicinity of Indian villages all the time. I am somewhat familiar with them in the villages. I never went on but one reservation, and that was down here on the Merced River; I forget who was the agent.

Q. What are those Indians called?—A. I do not recollect the name of the reservation. That was in 1852. In the latter part of 1851 I was engaged in a campaign to subdue them. We had a fight with them. They made peace, and we placed them on a reservation.

Q. Since then you have not had much knowledge of their management?—A. No, sir. I was in the vicinity of the reservation for five or six months.

Q. Do you know any of the present agents?—A. I do not think there is any reservation there now.

Q. Have you seen any of those Indians recently?—A. No, sir. I saw them in 1853 or 1854. In that section of the country there seems to be a certain section where the Indians are what we call wild, and there they were disposed to fight.

Q. You say there is no reservation there now?—A. No, sir; I think not.

Q. What became of the reservation if they had one at one time?—A. The Indians became scattered. The government changed the reservation further south. They made them a reservation down there.

Q. By treaty stipulation; or was land taken by citizens from them?—A. It was done by the government.

Q. You think it was by treaty with the Indians?—A. By contract with them. I do not think there was any particular treaty with the Digger Indians in this case. If so, I never heard of it.

Q. Are those Indians acting on their tribal relations, or are they scattered?—A. I should think in that direction they are pretty much in their primary condition. In fact, I do not know what has become of them. When I came to California you could not go anywhere without encountering Indians.

By Mr. BOONE:

Q. The management of our Indians in treaty relations with the government is now in the Interior Department, and you know we have an Indian Bureau to manage all their affairs.—A. I am aware of it.

Q. There is some complaint in different quarters, and there has been a move to transfer the management of them to the War Department, simply taking it from the Interior and putting it in the military department. Now the purpose we have in view is to find out if you know of any agent here or know anything in reference to the conducting of the Indian affairs by the present agents within the last few years, and of the administration of their affairs by the Interior Department?—A. No; I do not know as far as I am concerned. As to the reservations, I have not been near them, and am not familiar with them.

Q. Or if you know of a tribe of Indians at one time prosperous that have been scattered and disbanded, and their property destroyed; and, if so, if you can assign a cause for that, we would like to have you do so.—A. The Indians I have been acquainted with had but very little property. Our Digger Indians in the early days did not incline to have horses like the Indians in the Atlantic States.

Q. There were no treaty relations with the Digger Indians?—A. I

never heard of any. In the middle portion of the State, and further south, I do not think there was any formal treaty. If there was, I never heard of it. But in the northern part of the State I understand there was. A portion of them belonged to the old Catholic missions in California, and were comparatively civilized.

Q. You know nothing of how the present agents of the Indians in this State are conducting their affairs?—A. Only through reputation. I do not know anything personally.

Q. You have heard no complaints from the Indians yourself? You have not been familiar with them?—A. I have heard no complaints from the Indians; have not seen them; have not seen a wild Indian for the last eight or ten years. There are a good many Pitt River Indians around through the country in which I live.

By Mr. STEWART:

Q. How are they getting along, those that are there now?—A. I think they are getting along very well. Many of them are good teamsters—some of them drive four and six horses.

INDIANS CAPABLE OF TAKING CARE OF THEMSELVES.

Q. If they were left alone they could take care of themselves, without the interference of the civil or military department?—A. I am satisfied they could without the civil department. Occasionally the War Department might be called upon to advantage. From what I have seen in California away back in the early days on a reservation I was acquainted with I am satisfied that the Indians would get along much better without that kind of management, and I know two or three in my neighborhood who hire out and get 15 or 16 dollars a month. One in particular is a good teamster, driving four or six horses, and will take good care of them.

By Mr. BOONE:

Q. Your opinion is that the State of California can get along with her Indians without the interference of the Federal Government?—A. I think so; since the Modocs have been subjugated we can get along without either of the departments. The Indians incline to become pets. They come in our neighborhood and dig potatoes, and we used to employ them to quite an extent to dig potatoes.

W. S. M. WRIGHT sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. Santa Rosa, California.

Q. Have you any Indians in your vicinity?—A. Yes, sir.

Q. How far do you live from the reservation belonging to those Indians?—A. Fifty or sixty miles. I never was there. I think it is that far.

Q. The Indians you are acquainted with are off the reservation?—A. Yes, sir.

Q. Are they working around through the country?—A. Yes, sir; they make their own living. Once in a while one will steal a little; and some of the whites do that, too.

INDIANS AVERSE TO LIVING ON RESERVATIONS.

Q. Why is it they are off the reservation? Could they not do as well on it?—A. They were never disposed to go on the reservation. When I bought the ranch, eighteen years ago, they were on the adjoining ranch, and they wanted to come on my ranch and put up houses, and I permitted them, and they are there still.

THE TRANSFER SHOULD BE MADE.

Q. What do you think is the proper management of the Indians? What would you advise that Congress should do?—A. My opinion is (I only form it from the best opinions I get), the Indians would be much better off under military control than under the present civil management.

Q. You would want them to go on the reservation?—A. Those that are living in the country, that I have a knowledge of, make a very good living.

Q. What should the military do for them?—A. I suppose it is best to leave them alone. Better to do that than to force them to go on the reservations.

Q. If it is better for those would it not be better for all?—A. If they were all settled through the country and where they could get employment. I have never been on any reservations in this State.

Q. What would your advice be, that the military take charge of those on the reservations?—A. Yes, sir.

Q. Would the others return to the reservations?—A. Those who have settled in communities, and are getting along well and making a living, why, I should leave such alone. The civil authorities manage them there.

Q. Would they require any military services?—A. Not those who are living through the country. I know three or four, what we term rancheros, outside of those on my place.

Q. What advantages do you see in the military over the other department? If there is no necessity for war measures, would it be simply that they would be better clerks and better hands to pay out the annuities?—A. I think the money would go further.

Q. You think it could be more economically used?—A. I think so, sir.

Q. Would you advise the military simply to watch and guard their interests?—A. To supply them with annuities.

INDIANS SHOULD BE MADE AGRICULTURISTS AND STOCK-RAISERS

Q. Would you advise that they be turned into farmers and stock-raisers?—A. Teach them farming. Give them utensils and stock and the military to control them. That is all the control I think they would want.

Q. Do they seem to need controlling? Are they savage?—A. Those I am acquainted with are not.

Q. Have they been troublesome to the whites in later years?—A. Around the reservation?

Q. Yes, sir.—A. Not in that section of the country, so far as I know.

Q. Generally peaceable?—A. I do not think the supplies which the government furnishes to the Indians are all delivered.

Q. You think it would be better to turn the bureau over to the military department? We want the reason why you think so. Do they need military men to take charge, or do you simply think that military men are better qualified to instruct them in business, or do you think they would be more likely to pay out their money properly?—A. The Indians, I think, would be better managed.

Q. You say you have not seen the Indians on the reservation?—A. No, sir; I have never been on their reservation.

Q. You do not know about the number?—A. No, sir; what I said is from reliable authority.

Q. What do you know about the schools? Is there any attention be-

ing paid to their schooling?—A. In the community where I reside where there are families having Indian children, they are either taught or sent to school. Our State law provides for their education.

Q. Is that paid for by the State?—A. Yes, sir.

Q. Do you know whether their schooling is paid for on their reservation by the State or the general government?—A. No, sir; I do not know of my own knowledge; I am only informed there are schools there, but I do not know how they are paid for.

By Mr. HOOKER:

Q. I understood you to say you thought this Indian Bureau had better be transferred to the War Department. Is your reason for embracing that opinion founded upon the fact that you believe there would be a more honest administration?—A. Yes, sir.

Q. The Indians would get what is due to them?—A. What is appropriated.

Q. The agents could be called to a severer accountability for doing wrong?—A. I am satisfied the Indians do not get what they are entitled to on many of the reservations.

Q. And therefore you are in favor of a change?—A. Yes, sir. I could go on and state many things, but I don't think it is necessary.

By the CHAIRMAN:

Q. Do you know any of the late agents?—A. No, sir.

Q. Have you heard that they were in any way defrauding the Indians?—A. It came to me from a source which I consider reliable.

Q. Have there been any efforts made to punish them in any way?—A. Not that I am aware of.

Q. Were they turned out for these charges?—A. Not that I am aware of.

Q. Were these charges made to the department at Washington by you or others?—A. Not by me. I don't know whether others preferred them or not.

IRREGULARITIES OF AGENTS.

Q. Could you tell us how it came to you? What was the substance of that which came to you?—A. In one instance, in Arizona, not many years ago (a few years ago, however), the supply of bacon, for instance, which was purchased for the benefit of the Indians, was condemned and sold. A gentleman who was in that country told me it was fine bacon, and the merchants bought it and retailed it at fifty cents a pound. I can state who had something to do with that at the time.

Q. How long ago was that?—A. I cannot state the exact time.

Q. Within the last three, four, or five years?—A. I think not quite that long. It has only been a short time since I was informed.

Q. You know nothing about it yourself?—A. No, sir; not from my own knowledge.

INDIANS SHOULD BE NATURALIZED.

By Mr. STEWART:

Q. From your own knowledge of the Indians of this State, and their condition, do you not think it would be as well and even better for the government to withdraw its aid entirely and endow them with the rights of citizenship; would it not be more satisfactory than to retain these reservations and agencies and put them under the War Department?—A. I think if the Indians were permitted to set apart land and protected by the civil authority, and made to know they are to make their own living, I think they would be much better off.

Q. Endow them with citizenship?—A. Yes, sir. They would need some little assistance in the way of stock, farming utensils, &c.

Hon. W. C. HENDRICKS sworn and examined.

By the CHAIRMAN:

Question. What part of the country do you live in?—Answer. Butte County.

Q. In the northern part of the State?—A. Yes, sir; in the foot-hills of the Sierras.

Q. Have you any Indians in your vicinity?—A. Yes, sir; not so many in that region, but they are scattered all over the country.

Q. How near do you live to the reservation?—A. I know nothing about the reservations.

Q. Have you any opinion upon the subject of the transfer of the Indian Bureau from the civil to the military department?—A. Yes, sir; I have a very decided opinion on that subject. I know nothing about the reservation, however.

THE RESERVATION SYSTEM SHOULD BE ABOLISHED.

Q. Give the committee your opinion whether these Indians can be made self-sustaining without any assistance on the part of the government either by the military or civil authority; do you think it is possible for that to be done? We would be glad to have your opinion.—A. From the knowledge I have on the subject, from talking with the Indians forced on the reserve, and who have returned two or three times, my opinion is that all the money spent on it is an absolute injury to the Indians. Their nature is to run wild, and when you undertake to confine them on a reservation it is an injury to them. They want to do for themselves and be free.

Q. How do these Indians talk to you; are they disposed to go back on their reservation?—A. No, sir. I know one Indian who supports himself very well by washing; he said he never would go back, that he would die first.

Q. What would you consider necessary qualifications for an agent?—A. I do not know anything about it; I do not believe in the system at all. I think the Indian is naturally bound to die and pass away before the white man, and the cheapest way to the government and the best way for the Indian is to let him alone.

Q. You would make that apply to Indians, of course, who have been taught to labor, and who, to some extent, take care of themselves. Do you think that would apply to the Indians in their natural state?—A. It would apply to all the Indians I know anything about.

Q. You have no knowledge of what we call savage Indians?—A. They are wild to a certain extent. They live in old fashioned wigwams and work for the white people in the country districts. They make fine herdsmen, and a great many of them are employed in that capacity.

INDIANS CAPABLE OF SELF-SUPPORT.

Q. So far as your knowledge extends, you think they could take care of themselves in your own State if they were free and allowed to do so, and if they were allowed to take the advantages of your own citizenship?—A. Yes, sir; I think the government would save the money, and the Indians would be better off.

Q. You know nothing of your own personal knowledge of agents failing to pay over the money?—A. No, sir; nothing at all.

By Mr. HOOKER:

Q. You speak now of those living in your neighborhood?—A. Yes, sir.

Q. Do they own any land?—A. I do not know any who own land. They have their little possessory claim in mining camps, the same as white men, and they are respected.

Q. No titles to their lands, have they?—A. No, sir.

Q. They are laborers for white men, are they not?—A. Yes, sir. A great many white people labor, and in the same manner.

Q. When you speak of their needing nobody to assist them, you refer to those Indians in this State who have no annuities to be paid to them either in the shape of rations or clothing or blankets, or per capita money?—A. Yes, sir.

Q. You refer to that class?—A. Yes, sir.

INDIAN LANDS SHOULD BE INALIENABLE.

Q. Do you believe if the Indian was left to himself to dispose of the reservation—suppose it was allotted in severalty and the Indian had the right of alienation, do you suppose in 25 years he would have any of it?—A. No, sir.

Q. Do you not think it would all go?—A. I do not think he would let it all go, unless it suited him to leave. If it was the country to suit him he would be slow to let it go. They become much attached to their homes.

Q. Do you think that would be the case with the Indians if they had the power of alienation? Do you think that would apply to the lowest class of Indians?—A. According to my understanding that is a trait, and would apply to ordinary Indians.

Q. I mean to say this: Does an Indian put any such value upon lands, if divided in severalty, as to retain them, or would he be likely to be deprived by a surrender?—A. He has a poor idea of money values of land, and if he made up his mind to dispose of them, he would be as likely to do so for a red shirt as for a thousand dollars.

F. P. FORSTER sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. In San Diego County when I am at home.

Q. In this State?—A. Yes, sir.

Q. Have you any Indians in your neighborhood, or any reservation that reaches that section?—A. We employ about a hundred sometimes.

Q. Do these Indians live on a reservation?—A. No, sir; all of those Indians in the southern part of the State have a good deal of property. We have different tribes there.

Q. What tribes?—A. The Digger Indians. They are called the Mission Indians down in our part of the country. They had different villages through the country, and they were employed in farming. They were pretty wild until the emigrants got in and dispossessed them of their lands, and then they became vagabonds.

Q. Were those Indians on the reservation?—A. There has never been a reservation until lately. Animals cannot live there, much less Indians. It is a very poor country, on the top of the mountains.

INDIANS WILL DO WELL IF GIVEN A START.

Q. What is your opinion of those Indians? What is the best that could be done for them?—A. These Mission Indians, if you were to pro-

vide for them, and give them land and something to start on, they would do well. They are intelligent and willing to work; but, as I said before, their property has been taken away from them, and they became entirely worthless, working here and there, in all parts of the country. As I stated, if these Mission Indians were provided for and given a start, they would do well. There has been an agent appointed to take care of them. He has never done anything for them. I know the man. He went down there once or twice and took a turn through the country, and made some propositions and offered to do something; but he has never done anything. The result of it was the Indians at one time became dissatisfied, and they were going to have war; but they were intelligent enough to know that they were going to be whipped, and rather than be killed they submitted. They are actually desolate. They have been driven from their homes. They have no right to take 160 acres. When this thing was going on they had good land, of course—the best land they could find in the country. The whites naturally would get it as soon as they could have it surveyed or located, in some way or other. For myself, I bought some land on which an Indian village was established for years—ever since I was born.

By Mr. HOOKER:

Q. What is the name of the agent?—A. Mr. Dryden. He is a preacher.

By Mr. BOONE:

Q. Was he appointed by the Interior Department?—A. I think he was by the Indian Bureau. I went with him once. The Indians were driven off from Temecula and dispossessed by the sheriff. He went down to see the Indians. They were first on the side of the mountains, and he promised to go and attend to them, and said he would provide for them, but he has never done anything.

By the CHAIRMAN:

Q. When did you see these Indians?—A. I saw them about three weeks ago, some of them.

By Mr. BOONE:

Q. You say this agent was a minister?—A. Yes, sir.

Q. Do you know what denomination?—A. I do not know.

Q. Was he a Methodist or a Presbyterian?—A. I do not know; I know he is a preacher.

Q. I will ask you whether or not these Indians are Catholics?—A. Yes, sir; most of them are Catholics. He was a Catholic, I think.

By the CHAIRMAN:

Q. Was he missionary or agent?—A. Agent.

By Mr. BOONE:

Q. You say he did not attend to them, but went down and made some propositions?—A. No, sir; he never attended to them.

By the CHAIRMAN:

Q. What is your opinion of the advantages or disadvantages of the contemplated change?—A. Those Indians that are civilized will do better alone if they are provided for.

INDIANS WILLING TO WORK.

Q. Without any agent?—A. Yes, sir. All they want is a start. They are all willing to work; all you have got to do is to give them land and

a little means to go ahead on; all they want is land and some assistance to start.

Q. If I understood you awhile ago, this land set apart for them is not good land?—A. It is not worth a cent an acre; it is not worth anything. I would not have it and pay taxes on it.

Q. There is good land in that country?—A. Yes, sir; but all the good land is taken up principally by white people.

Q. There would seem to be no chance for these Indians to get along?—A. Except to buy them some property and just tell them, "That is your property," and they will all go there and finally become good. They all wander through the country. They are very industrious. You will see fifty or one hundred of them go in shearing times, and they all go with a head man through the country shearing, and that is the way they have for supporting themselves now. They work in the different ranches. They raise a good many sheep there now.

INDIANS CAPABLE OF SELF-SUPPORT.

Q. You think, if these Indians had got lands allotted to them equal to those of the white people in that country, that they would be able to take care of themselves, without any agent from either department?—A. Yes, sir; but those lands must be bought for them somewhere near the place where they were born. They all prefer the place where they were born. You cannot keep these northern Indians in the south part of the State, nor the southern Indians in the northern part of the State. It is a good deal easier for the white man to put up with the habits of the northern Indians than for the southern Indians to do the same thing.

By Mr. BOONE:

Q. You spoke of some aid being furnished to those Indians, and, if furnished, they would be self-sustaining. You seem to be an intelligent gentleman, and we want to get your opinion as to who would be most likely to invest the funds appropriated or given to them by the government, the Interior or the War Department.—A. It seems to me any honest man could provide for these Indians, whether he be civil or military. He could do the whole thing in a month.

Q. Would they want simply an honest administration?—A. Yes, sir. In a month you could provide for all these Indians, and it does not matter whether the one who provides for them belongs to the War Department or to the Interior or civil department. If he does what is required of him, that is all that is necessary. So far it has not been done.

Q. Are there treaty relations between those Indians and the government?—A. Every time they raise a rebellion they go and make propositions to them. As far as the wild Indians in Arizona are concerned they differ altogether from these Indians.

Q. You think that by giving them a small start the government might withdraw its aid from them entirely?—A. Yes, sir.

Q. Or leave them alone to the State of California?—A. Yes, sir.

Q. To be brought under the jurisdiction of its laws?—A. Yes, sir.

Q. And amenable to its laws and live like other citizens?—A. Yes, sir.

INDIANS NOT DISPOSED TO PART WITH THEIR LANDS.

Q. Would they be self-sustaining in that condition?—A. Yes, sir. You will find they are the hardest fellows to part with their lands you ever saw. If the land is worth anything they will hang on to it for all it is worth.

Q. Do they speak the Spanish language?—A. Yes, sir; and the English.

Q. Do they attend church, and have schools and send their children to school?—A. As far as that is concerned they are a little demoralized. They are not as they used to be. The very fact of having been driven from their homes and their families separated has somewhat demoralized them. They are not so honorable as they used to be. They used to attend church. The first thing would be to build a church and provide for a priest. Every once in a while they would provide for him themselves. They would hire a school-teacher in some cases in some places where they had large towns, and would educate their children.

Q. Do they dress in citizen's clothing?—A. O, yes.

Q. They are not blanket Indians?—A. No, sir. Some of them dress as well as anybody. We have some very honest men, very honorable hard-working fellows, who are working for us and take care of their families. They have been driven from their homes and the land has been taken away from them.

INDIANS RETROGRADING.

Q. They are becoming poorer and more degraded?—A. Yes, sir.

Q. Have you anything to say in reference to the Arizona Indians?—A. In a few words I will speak of the Arizona Indians. Most of them are wild. They want some one to instruct them and put them to work. In the Rio Verde Reservation General Crook was feeding the Tontos Indians and he was bringing them together in that locality. That is one of the best places in Arizona, and as soon as he got them in there he commenced to make them work, building ditches and raising their own stuff. In the one or two years he had them there they were raising and working and willing to work. They wanted horses. As soon as the agent came and took possession of the Indians they didn't suit him. He had them removed from there to a place where they can raise nothing, and of course they simply have to live on what is given them. They never try to make them work. I think, as far as the military is concerned, they go out into the country and hunt the Indians and they study their habits. They drive them to the reservation, and, after they have brought them there, turn them over to a man who, perhaps, never saw an Indian. It is an absurdity. Every time the agent gets in difficulty he has to call on the military. Whenever they run away the military have to drive them back. The military know all about them, but this other man knows nothing.

Q. As long as they were under the control of General Crook they did well?—A. Yes, sir.

Q. And as soon as they were placed under the Indian agent, he not understanding them, they became demoralized?—A. Yes, sir. It seems to me the man did the thing intentionally.

Q. He put them upon a place where they could not make a living?—A. Yes, sir. If they had remained on the Rio Verde Reservation they would have been self-supporting to-day.

ARMY OFFICERS UNDERSTAND THE INDIANS BETTER THAN CIVILIAN AGENTS.

Q. I understood your statement to be that Army officers generally have better knowledge of the Indian character?—A. Yes, sir.

Q. And that he better understands the desires of the Indian than the civilian?—A. Yes, sir; he has been there and has come in contact with the Indians; knows all about them.

Q. And therefore it is your opinion he would make a better Indian agent than a man who did not know anything about them?—A. Yes, sir.

Q. Have you traveled extensively among the Indians, and seen a good deal of them?—A. Yes, sir; I was born amongst them.

THE ARMY SHOULD CONTROL THE INDIANS.

Q. It has been said by some (and I will ask you to give your opinion) that the Indian does not like a military man, and that he has no confidence in him. What do you think about that statement?—A. For the simple reason that they fear them they do not want them. It is necessary to have the military over these wild Indians. You can keep them down through fear and make them work. They will work through fear and finally become civilized, and then after that turn them loose, give them property, and they will be just like all of us.

Q. Is it a fact that all through Arizona, wherever you traveled among the Indians, they have confidence in General Crook and in the honesty of the military officers with whom they have been dealing?—A. They would rather trust, when it comes to the real truth, those in the military than in the civil department.

Q. The reason you think many of them do not desire the military officer is because they know the military has the power to force them to do right?—A. Yes, sir.

Q. Do you know whether they have confidence in the administration of the civil agents, or not? Have you heard any expression upon that subject?—A. Not in Arizona, because the Indians there are not intelligent enough to express themselves, or know the difference, in fact, of one from the other. But the Mission Indians, of course they do not trust them.

Q. Do not trust whom?—A. Do not trust the Indian agents. They will not believe them under oath, such is the feeling. Perhaps that is a little severe, but these are facts, you know.

By the CHAIRMAN:

Q. What Indians were General Crook at war with in that country?—A. Tontos and Apaches principally.

Q. Do you allude to the Apaches when you say they would rather be in the hands of the military?—A. Yes, sir.

Q. They like the licking they got from the general?—A. Yes, sir. He has got more influence with those Indians, and it is through him that they are under subjugation, and if they knew he was dead I think those Indians would rebel to-morrow.

URGNELDE PEDRORENA sworn and examined.

By the CHAIRMAN:

Question. You heard the statement by Mr. Forster?—Answer. Yes, sir; I did.

Q. Do you concur with what he said?—A. So far as regards the Mission Indians, I do, sir.

Q. Have you anything additional to offer?—A. Nothing more than this: That time he spoke of when these Indians created a great deal of trouble in San Diego County, on account of being driven away from their homes, they came there to see Mr. Dryden, the agent. They asked him to take care of them and give them a home. All they wanted was a home.

Q. They would take care of themselves if let alone?—A. Yes, sir.

Q. They do not want any agent?—A. Not if they can get a piece of land that they can cultivate. On my ranch, we have some sixty families. They are all living around there.

By Mr. HOOKER:

Q. What was the character of the reservation which was set aside by this agent for them?—A. There were two townships set aside for them. I know they are perfectly worthless; they cannot work on them. They contained 23,000 or 24,000 acres, and I suppose about 500 or 600 acres on which they can raise something by irrigation.

Q. They asked for bread and they gave them a mountain?—A. Yes, sir.

By the CHAIRMAN:

Q. You agreed with him in regard to the Mission Indians. Do you differ from him as to the character and management of the Indians in Arizona?—A. I know nothing of them at all. I do not think I can add anything to what he has said in regard to the Mission Indians.

S. WOLFSKELL sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. Los Angeles.

Q. Have you any Indians in that part of the State?—A. Very few at present.

Q. You are not near any Indian reservation, are you?—A. No, sir.

INDIANS CAN SUPPORT THEMSELVES.

Q. The Indians that you have there are the kind that are scattered through the country and are trying to take care of themselves?—A. Yes, sir, and do take care of themselves.

Q. You do not know anything particularly as to what would be best for the Indians on the reservation?—A. Only what I have heard of the San Diego Indians.

Q. Is there any necessity for aiding those Indians you are acquainted with?—A. There are very few Indians in our county, and they are all scattered around. There are not enough of them.

Q. Are they doing pretty well?—A. They can take care of themselves.

Q. It is your opinion, if the Indians were furnished lands, that they could take care of themselves?—A. Yes, sir; I think so; nearly all want to work.

By Mr. MCCREERY:

Q. Do you think they ought to be managed by the War Department or the Interior Department; where do you think they would find the most advantages?—A. That I cannot tell you. It would depend a good deal upon what kind of an agent was appointed.

SAN FRANCISCO, CAL.,
October 3, 1878—10 o'clock a. m.

Capt. JOSEPH B. CAMPBELL sworn and examined.

By Mr. MCCREERY:

Question. Have you had any experience in Indian affairs in the West?—Answer. Some little; yes, sir.

Q. We are directed by the resolution of Congress to inquire into the expediency of transferring the Indian Bureau from the Interior to the War Department. If you have formed any opinion as to whether or not it would be advisable, we would be pleased to have you state it?—A. Well, sir, I have thought of it.

THE TRANSFER SHOULD BE MADE.

Q. Give us the result of your reflections upon that point.—A. I can make a summary by saying I think it would be a great benefit for the Indian, but I have grave doubts as to whether it would be beneficial to the Army.

Q. What benefit do you think it would be to the Indian?—A. Wherever I have seen officers in contact with the Indians and having anything to do with them I have generally noticed that they were steady, easily managed, and obedient to what was required of them, and I have not noticed that to be the case when they were away from the Army influences. I will say, however, that my experience has been limited. For two years I was acting Indian agent myself. For six months I was in the Sioux country during hostilities. That constitutes my experience.

Q. How do you think the transfer would operate as a measure of economy to the government? Do you think the cost of management would be more or less than under the present system?—A. As I understand the question, the economy depends upon how much would be appropriated. It depends upon the money that is appropriated. I suppose it would all be spent.

Q. If officers of the Army were detailed to act as agents would or would it not be a considerable saving in the way of present salaries paid to the Indian agents if the same duties were performed by Army officers?—A. If you take an officer away from his legitimate duty to do another man's work, I suppose there would be so much saved as the man's salary whom he replaces would amount to. But whether it would prove to be a matter of economy with reference to his other duties I could not say.

TRANSFER DETRIMENTAL TO THE ARMY.

By Mr. BOONE:

Q. You have expressed some doubt as to whether the transfer would be beneficial to the Army, or rather intimated that you doubted the propriety in consequence of its influence on the Army.—A. Yes, sir.

Q. If this transfer was made to the War Department, and Army officers were simply detailed as agents to disburse the appropriations that are made by Congress and to carry out the treaty stipulations between the Indians and the government, how could it possibly affect the Army?—A. Well, sir, I think the whole machinery which is now administered would become another hostile element to the Army. It would deprive those people of fees, and it would open their batteries upon it.

Q. You do not, therefore, think it would necessitate more troops in

the Indian country than if civil agents continued the management?—A. I think it would probably take less.

Q. Our appropriations are made in accordance with the estimates which are furnished to Congress—at least that is the character of our appropriations. You stated a while ago that so far as it was a matter of economy you supposed whatever was appropriated by Congress would be disposed of, and you did not know how it could affect economy?—A. No, sir.

ACCOUNTABILITY OF ARMY OFFICERS.

Q. They are based upon estimates furnished by the Interior Department and Indian Bureau. State whether or not it is your opinion Army officers would more faithfully and honestly and economically expend whatever was necessary for the support of the Indian than present civil employés do.—A. All disbursements by Army officers in the line of legitimate duty are watched and guarded by a great many checks. If an Army officer had an inclination toward peculation or fraud, I think these checks and balances would be a restraint upon him, and, in my experience, I have known very few officers to undertake to peculate or be dishonest.

Q. State whether or not it is your opinion that because of the strict accountability which the Army officer is held to in disbursement of funds going through his hands, it is not next to impossible to misappropriate money without detection.—A. I think it is impossible for an Army officer under the present system of Army accounts to misappropriate, squander, steal, or get away with public money.

Q. You state that you acted as Indian agent for two years, I believe.—A. Yes, sir.

Q. What agency?—A. It was the general agency in Alaska.

Q. You were general superintendent of Indian affairs for that Territory?—A. It was called agent, but it was superintendent. There never has been money appropriated for those Indians.

Q. Have we no treaty relations with the Indians of Alaska?—A. None whatever. There never was any money appropriated for those Indians in that country to my knowledge.

Q. Have you any personal knowledge of the manner in which the Indian agents appointed by the Interior Department have managed their affairs in this country; whether it has been satisfactory or unsatisfactory?—A. I have no official knowledge, but I have knowledge derived from observation to some extent.

INDIANS OVERESTIMATED BY INDIAN AGENTS.

Q. What has been your observation or knowledge upon this subject; have they satisfactorily attended to their duties or not?—A. I went to the Red Cloud Agency in the fall of 1876 in command of a body of troops. Shortly after our arrival there, or before that time, I cannot tell just when, but about the time of our arrival the civil agent was superseded by the military officer, who took charge of the issue and disbursement of the annuities and goods to the Ogalalla Sioux, Cheyennes, and Arapahoes. The first step taken by the military agent was to count his Indians. I know, from common report and from intercourse with this officer, that they found the number of Indians to be very much less than the aggregate of rations issued under the civil superintendent.

Q. State, if you please, if it is not a fact that the system of purchasing goods, of inspecting goods and supplies, and of transporting them as now exists in the military department of the government is not greatly superior to that system practiced by the Interior Department in

furnishing Indian goods.—A. I have not sufficient knowledge to make any statement by comparison. The Army transportation is generally very good—regular and efficient.

Q. And their system of inspection?—A. Is very good. The stores supplied to the Army are always just exactly what they should be.

By Mr. STEWART:

Q. Do you know of any reason why the same system of accountability and means of transportation now in vogue in the Army could not be applied by the Interior Department, and if that should be done would it not overcome some of the objections which you have to the management by the civil authorities? In your reply to the question of Judge Boone you said the advantage would be with the Army because of their superior method of transporting supplies and purchasing them, and of their accountability to their department.—A. Yes, sir.

Q. If the same system could be adopted by the civil department would not that overcome the objection you have to the civil department in its administration?—A. Yes, sir; if it could be adopted.

Q. Could it not be adopted?—A. Not with the same hold upon the agent that exists in the Army.

Q. That is the point I want to get at. Could not the same system apply to the civil department that governs the Army in their management?—A. Well the difference is this, that an officer of the Army is supposed to hold his position during good behavior or for life.

Q. That is the moral restraint. I am referring to the system of accountability.—A. There is no reason why it should not be extended to any branch of the government.

Capt. M. T. MILLER sworn and examined.

By Mr. MCCREERY:

Question. You heard the questions propounded to the witness who has just given his testimony. You may proceed to give your views upon the same subject?—Answer. If you will excuse me I did not hear them; I was engaged in conversation.

Q. This joint commission has been appointed to ascertain the expediency of transferring the Indian Bureau from the Interior to the War Department.—A. Yes, sir.

THE TRANSFER SHOULD BE MADE.

Q. If you have had any experience that will enable you to give an opinion upon this subject we would be glad to have it.—A. My opinion about the transfer to the War Department is that the transfer would be beneficial to the Indians and to the detriment of the Army. It will benefit the Indians in that they would get better and more responsible treatment. They will get all their supplies. They respect the Army officer. His word would be almost the same with them as law. On the contrary, the Army would be injured in this way—companies would be deprived of officers who would have to act as agents, and now we do not have as many as we require; and then there are certain temptations to officers acting as agents which would probably redound to their discredit. I have known cases where there has been improper alliances made, especially with the squaws, that reflect upon the Army. That is particular. It is particular when it will occur. I have known it to be so. We do not want anything of that kind. Therefore we would rather keep away from the Indians.

Q. Has anything of that sort happened with the civil agents?—A. I do not know, sir; I do not know anything about them. There are various other reasons why I think the Indians should go to the Army. It would probably prevent wars by their being put with the Army, and in that way it would be economical.

By Mr. BOONE:

Q. I understand you to say that you think as a matter of economy to the government and mercy and benefit to the Indians that it would be better to let the War Department have charge of these Indians?—A. Yes, sir.

Q. The objection you have to it is that in some instances it would perhaps interfere with the morality of the officer in charge?—A. Not generally with the Army, but with some particular ones. Not generally but particularly.

Q. Army officers in that regard would perhaps be no more liable to charges than other men?—A. I think not nearly so much so. Only very particular cases. They have in the Army occasionally some men that cannot resist temptation of that kind. But it is very seldom.

Q. There is a good deal of human nature in the Army as well as elsewhere?—A. Yes, sir.

ACCOUNTABILITY IN THE ARMY.

Q. Your system of accounts in the Army is, as we understand from Army officers, a very strict one?—A. Yes, sir.

Q. And in the disbursement of money, such are the checks and balances, that it is next to impossible for a man to appropriate money that comes into his hands without detection?—A. Yes, sir; it is.

Q. The Army officer holding his position during good behavior, and being dependent upon that as a profession, state whether or not you think that of itself would be a very powerful argument in favor of honest administration of Indian affairs with the Army?—A. It is one of the most powerful, in my opinion. I presume that is what makes them better and more correct than civil agents. I do not know of any other difference. They all come from the same people.

By the CHAIRMAN:

Q. While you seem to answer that it would be an impossibility for fraud to be practiced by the Army under their system, it has been stated (whether or not it is true I do not know) that where the military has authority, and a necessity arises for an extraordinary expenditure or an expenditure arising from some emergency, that that is paid without going through the regular course of auditing at Washington City, on the recommendation of the officer and statement that there was a necessity for this thing. That is, that it is paid without being audited?—A. I think not, sir. All expenses of the Army are audited. Sometimes those emergencies, even, are stopped against the officer, and I think those accounts are regularly carried up and audited.

Q. It is a question that has been propounded and accompanied by a statement that such was a fact, that officers feeling that they were authorized to make some expenditure under an emergency would do so. The question is whether that is paid on the recommendation of the officer that caused it without any further proceeding or orders or any particular auditing—whether it is by law bound to be paid?—A. No, sir. The officer ordering the thing is responsible in the first case, if it is not in accordance with law. It is audited.

CAUSE OF INDIAN WARS.

By Mr. BOONE:

Q. I would be glad if you would state what has been the cause in late years of our Indian wars.—A. I have been in three wars in the last four years. The first was the Modoc war. I think the cause of that war was an attempt to remove them from lands which they thought were their own. The primary cause of the removal was produced by citizens desiring to get them away from that land as soon as possible.

Q. Land speculators?—A. Yes, sir. The next was the Nez Percés war, which resulted from the same cause. Land speculators were crowding them all the time. I think they killed one of their Indians. That war was in progression for two years. I knew it was coming on for two years. Finally it came. That is the primary cause—citizens doing something—killing the Indians, or something of that sort.

Q. Encroaching upon what was conceived to be their rights?—A. Yes, sir. This Bannock war this year seems to me to have resulted from a different reason. They thought by combining that they could whip the whites. The Modocs had had great success. The Nez Percés had had considerable success. The Bannocks were scouts with us, and knew how the whites fought. The leader, Buffalo Horn, conceiving that by effecting a combination he could clean out the whole country; and I think the result would probably have been different if he had not been killed at the outset. Another reason for this late war was, I think, the fact that they received a smaller appropriation than they had been accustomed to. I happened to receive the surrender of the Piutes and inquired into the reason of their war; they told me it was because of the ill-treatment by the agent, and not getting all the moneys which should have been paid to them. For instance, they said they received a dollar a day for work wherever that agent would set them. This last year the agent gave them only fifty cents for the same work. They have also accused him (perhaps unjustly) of stealing their flour and keeping back moneys due them for pasturage.

Q. Due to the tribe?—A. Yes, sir, for pasturage. Cattle-herders take their cattle across the country and they charge a dollar a month for pasturage, and there are certain permits for saw-mills on the agency for cutting lumber. They thought they were cheated out of that money; and then the management of their tribes in the way of punishment. For instance, agents inflicted small punishment upon the children, and even punished the squaws—whipped them. That aggravated the Indians. The same, I suppose, would hold good with white persons—they would prefer to punish their own children. An officer of the Army would not condescend to such a thing as that. He would prefer to deal with men under him according to law and upon some well-founded principles. Civil agents, in many cases, do not do that way.

Q. Officers of the Army necessarily are thrown more or less in contact with the Indians of the country?—A. Yes, sir.

Q. And, therefore, are compelled to know something of their habits, character, and disposition?—A. Yes, sir.

Q. State whether or not a man understanding something of the Indian character is better qualified to manage him than a man who knows nothing about him.—A. Necessarily it must be so.

Col. A. V. KAUTZ sworn and examined.

By Mr. MCCREERY:

Question. You have heard the scope of the inquiry. Will you proceed to g ve your opinion upon the subject under consideration?

THE TRANSFER SHOULD BE MADE.

The WITNESS. My opinion is that it would be beneficial to the Indians of the country and to the government to make the transfer of the Indian Bureau to the War Department. As commander of the Department of Arizona, I was an advocate of the transfer, but as a post commander in a subordinate capacity I am not an advocate of the transfer.

Q. Will you give your reasons for having been in favor of the transfer at one time and your reasons for not favoring it now?—A. As department commander I was responsible for the peace of the Territory of Arizona, and if I could have had control of the Indians I could have preserved that peace much better than not having control of them. As post commander I should have no such responsibility, and there is a certain taint connected with the management of the Indians that would not redound to the Army, I believe.

Q. Give your reasons why you think it would be more economical to transfer the bureau.—A. I believe it is possible, with unrestricted powers on the part of the Army, to make the Indian entirely self-supporting. I believe the agents can be dispensed with entirely. I will add that I have been in the service about 26 years as an officer of the Army, and all my service has been on the frontier with the Indians except during the war.

Q. Will you please detail any facts that have come to your knowledge connected with civil management under the agents of the Interior Department?—A. I have put myself on record in my annual report of last year. I sent a copy to each member of this commission, but I do not know whether they received it or not. Those facts I can prove and substantiate.

Q. Will you make a short detail of the facts so that they may be embodied in the testimony?—A. I do not know whether I can remember them in a connected form or not.

THE NUMBER OF INDIANS OVERESTIMATED BY CIVILIAN AGENTS.

Q. Well, disconnected, then.—A. One fact that I referred to was reporting the number Indians in excess of the number really at the reserve. I was called upon to assist in the removal of the Chi-ri-ca-hua Indians to the San Carlos Reservation in 1876. The Indian agent had reported 965 Indians upon that reservation. We got them together to remove them, and we removed 324, and it was claimed that about 30 or 40 had made their escape. That was all the Indians before referred to.

Q. Was it a fact that 30 or 40 had escaped?—A. There were a number escaped. The highest number claimed was 250. I traced those Indians to the Warm Spring Reservation and brought out the fact that they were making the Warm Spring Reservation of New Mexico a base of operations against the settlements in Arizona. That brought about an order for the removal of the Warm Spring Indians to the San Carlos Reservation also. That removal was made. In 1875 they reported 2,200 at the Warm Spring Reservation before the accession from San Carlos of 250 that were alluded to. Although it was not claimed by the Chi-ri-ca-huas that more than 30 or 40 got away, it became to the interest of certain parties, especially the governor of Arizona, to report that 250 got away. Notwithstanding this accession in 1876, they reported only 1,600 the next year at the Warm Spring Reservation, and when they were finally removed in the spring of 1877 they brought only 454 as the sum total.

Q. Have they been drawing rations for 1,600?—A. I cannot say that; I have no means of knowing. I had experience as the commander of the

post of Fort Stanton, New Mexico, in 1871. I succeeded in getting the Mescalero Apaches on a reservation there. They were hostile from the time I took charge of the post in 1869 until I succeeded in getting them all in in 1871, or got quite a number in. As soon as those Indians were brought in a civil agent was sent there. The very first report which the agent made of the number of the Indians at Fort Stanton in 1871 was about 600, I think. The number continued to increase until I left in the spring of 1872, they claimed 1,400 Indians on that reservation. I subsequently learned by letters that as high as 1,800 had been claimed, and the last number I heard was 2,200. I do not think that the whole number of the Mescalero Apaches can possibly be above 500. I do not think that they exceed that number. They now report on that reservation 1,400 Indians. The San Carlos Reservation incorporated what is called White Mountain Reservation also. The White Mountain Indians were required to remove down to the agency, and they were taken down there on the pretext that they could raise two crops a year at San Carlos and only one up in the White Mountains—about 60 or 70 miles' difference between the two points. San Carlos is very much lower than the lands in the White Mountains. The greatest amount that has been claimed by the agent of subsistence produced by those Indians is 12 per cent.—6 per cent. by hunting and 6 per cent. by agriculture. The reason assigned for the removal was that they could raise two crops a year at San Carlos. I think, according to the last report of the Indian agent, they have been furnishing 100 per cent. of rations.

FORCE NECESSARY IN MAKING INDIANS SELF-SUPPORTING.

By Mr. BOONE:

Q. They did not raise anything?—A. No, sir; did not raise anything. When those Indians were under the charge of General Crook, during the time he was in command there, about the time I relieved General Crook, those Indians were turned over to civil agents. At that time they were in a fair way of being self-supporting. They were made to work by the presence of the troops. I think that is the only way the Indian can be made self-supporting—by force. If he is compelled to do it he can be made to do it; when they see they all have to work they are all willing to work, because it is the idea that one portion of them are not obliged to work and the others are that makes them restless about it.

By Mr. MCCREERY:

Q. If they had the alternative—labor or starvation—most of them would work?—A. Yes, sir. There are only two things which will make the Indian work—fear and hunger.

By Mr. BOONE:

Q. You stated that those Indians, when they were taken from under the control of the military and civil agents were appointed over them, at the time General Crook was relieved, were self-sustaining, or about so?—A. Yes, sir.

Q. How did it turn out when they were turned over to the civil department?—A. They were all concentrated on the San Carlos Reservation.

Q. Are those the same?—A. Yes, sir.

By Mr. MCCREERY:

Q. They did not raise anything toward their own support, according to the last report?—A. No, sir. I would call the attention of the com-

mission to my report. It was sent to Washington. I have taken very positive ground there in relation to this matter. The decided stand I took in my annual report I am satisfied brought about my removal from the command of that department through influences originating in the Interior Department. I was regarded, I presume, as antagonistic to that branch. I was so situated that I had to take decided views upon this subject, and what I said I knew to be true, and I can substantiate it.

WHITES ENCROACHING UPON THE INDIANS.

By Mr. BOONE:

Q. I want to ask you a general question. The last answer suggested it to me. There are a large number of white men who are attempting to speculate upon the Indians. Are these not on their lands and encroaching upon them.—A. Yes, sir.

Q. State whether or not that class of men, as far as you know, are very much opposed to the Indian management being transferred to the military department.—A. Yes, sir; they are.

Q. Can you give the reason of that? Give us your opinion as to why that is so.—A. The reason is they have a great many more officers to corrupt in the Army than they would have under the Interior Department before they can hope to attain their ends.

Q. They are generally a little harder to approach on this subject; are they not?—A. I hope they are. I do not like to say anything more for the Army than for any other class of human beings, as far as that is concerned.

ACCOUNTABILITY OF ARMY OFFICERS.

Q. There are certain reasons why it would be so, considering men are equally honest in civil and military life?—A. Supposing they are equally honest, the advantages are very much in favor of the Army officer being more honest than the civil agent, for the reason that he is surrounded by influences which control him. In the first place his accounts are very strictly audited, and he has a good number of fellow-officers around him to influence him. And when it comes to any corruption upon the part of the contractor he has got to influence a great many more men than he would have to where there is simply an agent at a reservation.

Q. In your case you were relieved from the command of those Indians of the Department of Arizona?—A. Yes, sir.

Q. I would be glad if you would tell the commission whether or not, as far as you are able to answer, your removal was urged by that class of men on account of the fact that an agent countenances their efforts at peculation.—A. I believe that was the reason of my removal.

Capt. G. M. BRAYTON sworn and examined.

By Mr. MCCREERY:

Question. You are aware of the inquiry we are making. You have heard the statements of the witnesses who preceded you. It may make your remarks briefer probably to state whether you concur or non-concur with the statements; at the same time give any information in your possession of facts of your own knowledge.—Answer. I can say I concur in all I heard this morning. I will change but one thing. I believe it will be not only a benefit to the Indian to transfer the Indian Bureau from the Interior to the War Department, but I believe it will be a great saving of labor and hard work to the Army. I think that the system of purchasing and issuing supplies will not compare with those of the Army. I believe all the civil agents can be dispensed with, and that in

fact all the civilians, or nearly all, now employed at the agency can be dispensed with, and their work done by soldiers. I believe that the Indians will get all they are entitled to, and on that account will remain on their reservations, and that of itself will save a large amount of expense which is now incurred in transporting our small Army from one point to another in order to whip these renegade hostiles back on to the reservations. My experience with the Indians, to be sure, has been limited, but I can say this one thing, that in Arizona I have captured the same Indian squaws in parties three different times, and in every instance they have given me for the reason of leaving their reservation that they could not get enough to eat. When I told them the last time that I was going to send them back to San Carlos, and if they were again caught in the mountains that they would not be caught but killed, they said if I would put them anywhere about my post they would remain there and never leave; but if I was going to send them back to San Carlos I might as well kill them there.

Q. There was an Indian agent at San Carlos at that time?—A. Yes, sir.

CONTACT OF THE ARMY WITH THE INDIANS NOT DETRIMENTAL TO THE VIRTUE OF THE SQUAWS.

By Mr. BOONE:

Q. It has been stated (I think unjustly, but still we have seen the statement) that the proximity of soldiers to the Indian agencies has been detrimental to the morals of the squaws. I want you to state whether or not that is an unjust charge against both the Army officers and soldiers. Is it any more so than it would be with the same number of civilians?—A. Not so much so. I consider the charge as unfounded to a great extent. In the first place, the civilians about an agency live with the squaws constantly and continually. With a company or two of soldiers with an Army officer in control at an agency that thing might occur of course in special cases, but they would be so under the control of the officer that there would be very few instances, in my opinion.

Capt. HARRY C. CUSHING sworn and examined.

By Mr. MCCREERY:

Question. You have heard, I presume, the scope of the inquiry that we have indulged in?—Answer. Yes, sir.

THE TRANSFER SHOULD BE MADE.

Q. Probably it would be as well for you to state whether you concur or non-concur in the statements of the previous witnesses, and at the same time give us any additional information as to facts within your own knowledge. It is not worth while to propound special questions of all points.—A. I believe the transfer of the entire control of the Indians from the Interior Department to the War Department would be greatly beneficial to the Indians. The Army has to take charge of the Indians now. As soon as it comes to really taking charge of them it will be more beneficial to the Army to have complete control than this divided control. That is one point in the management of the Indians. When any trouble takes place the Army has to really take care of the Indians. They might as well have complete control as this divided control. I am in favor of abolishing entirely all civil control. Of course the Indian appreciates nothing but force, and for him to look to one person for subsistence and another for control, he does not understand

it and never will understand it. The only way to do is to have one central source of authority to which he will look for his regulation and for his punishment. That can only be done, as in any other case, by the authority being combined in one department.

Q. Have you had any experience in Indian affairs among the different tribes?—A. I have had no experience in their management. I was only with the Indians in Alaska and in two Indian campaigns—General Crook's campaign of '76 against the Sioux and General Howard's Nez Percés campaign. From information gained by observation and conversation I maintain those views.

THERE SHOULD NOT BE A DIVIDED JURISDICTION.

By Mr. BOONE:

Q. You think that the mixed jurisdiction which now exists is detrimental both to the Indians and the Army?—A. Yes, sir. They have to bear all the brunt of any trouble occurring, and they might as well have the whole control, so that if there is any responsibility to assume they will know what it is.

Q. Therefore, if a mistake is made under the civil jurisdiction, and force is required, as a result you are called upon to correct the evil?—A. Yes, sir.

Q. And to apply the remedy?—A. Yes, sir.

Q. And you think, therefore, that one jurisdiction had better have entire control?—A. Yes, sir.

Q. You think the hand that feeds must be the same that can punish, if necessary?—A. Yes, sir.

JOHN P. HAYNES sworn and examined.

Mr. MCCREERY. Without repeating the questions which have been propounded to the other witnesses, will you proceed to give your views upon the subject of our inquiry—the transfer of the Indian Bureau from the Interior to the War Department?—Answer. Well, I have this to say in connection with the matter, that my views agree very much with the military gentlemen who have given their testimony here in regard to this question. As a matter of course I have not had the same opportunity of observing minutely the working of the present system of Indian reservations as these gentlemen, where they have been in the neighborhood of established reservations. My observations in regard to these things have been limited, perhaps, to comparatively a small scope of the territory of this coast in the northwestern portion of the State, in a tier of counties adjoining the Oregon line, and from my observation of things in that country (I lived there 25 or 26 years before the reservation system was inaugurated, and have had quite an intimate acquaintance with relations between Indians and whites in that country), so far as these matters are concerned, and in relation to the Indians living in that district of the country, it seems to me that they are just as capable of taking care and providing for themselves as a large majority of our own race. It is true that in the settlement of the country the whites necessarily encroach to a considerable extent upon the Indians, and deprive them of some means of subsistence which they formerly had before the country was populated by the whites. But, at the same time, there has been a great diminution in the number of the Indians, and those that are left have in a great measure adopted, or rather adapted themselves to, the means of living resorted to by the whites. They can get employment at the hands of the settlers, and I would say

to-day safely that the principal part of the support of the Indians living in that region of the country is earned by their own labor. They work upon ranches in the employ of stock-men—any kind of manual labor that is required—and they can provide for themselves through that instrumentality now a good deal better than if subjected to anything like the hardships they formerly were when dependent upon their uncertain means of obtaining livelihood. They are in a condition in that section of the country to maintain themselves without any government aid at all.

Q. Or without the supervision of the military or civil authorities?—A. Perhaps it would be well to have the military there in case of trouble between whites and Indians, and to afford protection. I do not know. The day in that region has passed, by reason of the diminution of the Indians and their intercourse with the white population.

DIMINUTION OF THE INDIANS.

Q. To what influence do you ascribe the diminution?—A. Well, sir, a great many of them have been killed off in that region of country; they are continually engaged in war or little feuds between the different ranches. In fact, with the Indians in that portion of the State there is no such thing as tribal relations existing among them. You will find a large extent of country down on the flats, as we call it, where they speak the same language without any chief or head, and they are continually engaged in brawls in which many are killed. Some of them, as a matter of course, have been killed in their difficulties with the whites. Another thing I am satisfied of is that they have become, as a general thing, so thoroughly diseased with syphilitic and diseases of a kindred character that they have almost ceased to breed. I had that amply illustrated during an examination that I made in reference to the status of the Indians in the section in connection with the question of the proposed removal of the settlers from what was once the Klamath Reservation. I took a census of the number of Indians on that reservation, and I came to some of these small villages—for instance, where there would be from fifteen to twenty sqaws reported, and in a ratio of that number of squaws there would be from three to five, perhaps as many as six, papooses or children. That illustrates this process of decrease as forcibly as I could give it.

Q. How far do you live from the Oregon line?—A. I live now 100 miles—yes, about 115 miles south of the Oregon line; for twelve or fourteen years I lived within 15 miles of the Oregon line in the extreme northwestern county of the State—Del Norte.

By Mr. BOONE:

Q. You are somewhat familiar, I discover from your testimony, with the condition of the Indians that are still upon the reservation in California, and those who are not and who have adopted the habits of civilized life and are working about through the country. State the relative condition of the two classes; which is getting along the best.—A. Those that are living on the reservation, and those that are not?

Q. Yes, sir.—A. I have not had of late years any very close observation of the condition of those who are living upon the reservation.

Q. You have in years past, however?—A. Yes, sir.

Q. You spoke something about the condition of those Indians living upon some reservation or valley as being affected with syphilitic disorders?—A. It is the whole Indian population there. The reservation up there changed very frequently. Originally a reservation established at

the mouth of the Klamath River, known as Klamath Reservation. The reservation was changed from that place and removed from there to Smith River Valley, and after remaining there a few years it was changed to Trinity River, now known as Hoopa Valley Reservation.

THE RESERVATION SHOULD BE ABANDONED.

Q. The condition of the Indians in California is different from other places. Of course we would like to know what is best to do with them here as well as elsewhere. According to your observations, are they better off when permitted to hunt up work, when suffered to go off the reservation, or is it better to keep them on the reservation, under the jurisdiction of the agent, and permit them to draw subsistence from the government, &c. ?—A. My opinion in regard to that is simply this, that it would be a benefit both to the Indians and to the whites, and particularly to the government, I should say, on the score of economy, if the whole reservation system were abandoned. That is my opinion in regard to that matter, fixed and certain.

There is another thing I would say in connection with that matter, that the Indians themselves are decidedly averse to the whole reservation system, and there is nothing now, in that section of the country, that you can frighten an Indian so about as to threaten him with a reservation. In connection with this matter of the removal of the settlers from this old abandoned reservation on the Klamath, I passed through that region of country in the line of my official duty; have traveled over that district six times a year, and I should say, having been in that country so long, that I have a personal acquaintance with a great many of the Indians themselves, and they always talk to me about their troubles, and I have found their idea to be that they were going to reestablish the reservation there, and they seemed to dread that. As long as they were on the reservation, even if they were fed and provided for partially, there was always a restraint. They considered that they had masters, which was repulsive. An Indian likes to go and come when he wants to, perhaps as much as we.

Q. You are circuit judge in this State?—A. Yes, sir; we call it district.

Q. You have Indians in some parts of your district?—A. Yes, sir. I suppose there is a greater proportion of Indians by far, compared with the whites, than anywhere else in the State or on the Pacific coast.

EDUCATION AMONG THE INDIANS.

Q. State whether or not these Indians who are not on the reservation are sending their children to school, and whether or not they are sending to white schools. I believe, under your State law, they are entitled to the common school fund?—A. No, sir; I think not.

Q. Do they attend school at all?—A. No, sir; they do not. I am not aware of the fact of any of them attending school. What we call half-breeds are attending school.

Q. Are there any Indian schools in your neighborhood?—A. No, sir; none that have ever fallen under my observation.

Q. Half-breed children attend school?—A. Yes, sir; in some places they do. They have quite a number of them at Orleans Bar attending school.

Q. Making pretty fair advancement?—A. Well, yes. Some of them are considered to be unusually bright, but they do not seem to progress much. They get about to one point, but they do not have the capacity to continue to develop. They do not develop as we expect to see in our own race.

J. H. YATES sworn and examined.

By the CHAIRMAN:

Question. You have heard the questions propounded to these other witnesses?—Answer. Yes, sir, I did; but I have very little knowledge of the evidence I heard this morning.

Q. We are inquiring as to the feasibility of transferring the Indian Bureau from the Interior to the War Department?—A. Yes, sir; so I understand.

Q. We are here taking other testimony because it has been suggested to us that you have a peculiar condition of affairs here. Some of your Indians are self-sustaining and some still need the aid of government. Give us your general knowledge of these subjects.—A. I will state I went into this section of the country, that the gentleman refers to, 37 years ago. I found the Indians there were entirely naked with the exception of a little skin tied around them, and they were subsisting entirely on fish and seeds, and grass and weeds, and what little game they could kill with the bow and arrow. We went on there and took possession of their lands and encroached on them, of course. They never made any resistance to it at all. Now you may say they are civilized. They are good workers, wear good clothes and work for us. In some cases they cultivate land, build houses, and make themselves comfortable.

INDIANS OF CALIFORNIA PEACEABLE.

Q. Trying to make citizens of themselves?—A. Yes, sir; I should judge so. The fact is they never take the life of white men, though the Indians bordering on them have.

Q. They themselves have not entered in these raids on the whites?—A. No, sir.

Q. What do you call them?—A. Digger Indians, that tribe. They are inoffensive Indians.

Q. You think if they were let alone that they could support themselves?—A. They are living now better than ever before.

Q. They do not require any management, either from the civil or military authorities, do they?—A. None. They are perfectly independent. They are in a better condition now than ever before.

INDIANS OPPOSED TO THE RESERVATION SYSTEM.

Q. Do you know anything about the reservation Indians, as you call them, living in tribal relations?—A. I have no knowledge. None of these Indians have been taken to the reservation. Frequently they get away from this reservation adjoining and run in among those Indians, and the military pursue and capture them and take them back.

Q. You are of the opinion that the Digger Indians would be just as well alone, and would be able to take care of themselves?—A. Yes, sir. I fully concur with the judge, whose experience has been greater than mine.

Q. If you generally confirm what he has stated, it will not be necessary to go into the investigation of this matter to any great length. You concur with him?—A. Yes, sir; I concur with him fully.

JOHN TAYLOR sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. Santa Rosa, Sonoma County.

Q. How long have you lived there?—A. In Mendocino and Sonoma Counties, twenty years.

Q. You are acquainted with the Indians in that part of the country?—A. Yes, sir.

Q. You are not very far from the reservation there, are you?—A. I have been on it.

Q. Will you state to the committee what you think these Indians require or whether they require anything at the hands of the government?—A. I think the only thing they require is to be let alone. The Indians in Mendocino County have bought land and are living on it and are doing first-rate.

INDIANS OPPOSED TO RESERVATIONS.

Question. They are inclined to become citizens?—A. Yes, sir. Many of them have been taken up to the reservation, but they get away as soon as they can and come back and bring their families, and make a good living.

Q. There are a few who still hold on to their tribal relations on the reservation, are there not?—A. There are a few who are kept there by force, but I think if they had their liberty they would leave.

Q. Do they go off and work and leave their families there?—A. I do not know whether they do or not.

Q. The Indians you are acquainted with, are they inclined to build houses and live in them?—A. Yes, sir; a good many of them.

Q. And have given up the tepee?—A. A good many of them. Some, of course, camp around in little shanties.

Q. Have you anything to suggest in addition to the testimony already given?—A. No, sir; I do not know that I have. I think any change would be better than it is.

Q. The agent is appointed to rule them, and he pays but little attention to those who are off?—A. I think they generally draw the rations and issue them.

By Mr. BOONE:

Q. What is the relative condition of the Indians who are upon the reservation and those who are off; how do they compare in prosperity?—A. I think those off the reservation are living a great deal better than those who are on it. They seem to dress better and look better; there is not so much sickness among them. They have ponies to ride, and everything they want, seemingly.

Q. State whether or not it would be a benefit to the Indians of this State, so far as the reservations you are acquainted with are concerned, to abolish the whole thing and let them take care of themselves?—A. I think that would be the best thing to do for that reason.

CAUSES OF THE NEZ PERCÉS WAR.

Q. Had you any connection with the Nez Percés war?—A. No, sir. I was up in that country in Idaho at the time, but I was not in the war.

Q. Do you know anything of the cause that superinduced or brought about that conflict?—A. No, sir; I do not. I have a ranch in Eastern Oregon and Nevada; the first fight this season was at my place with General Bernard. They killed a great deal of stock for me and ran off a good deal. Several head of horses; and they burnt up my house and destroyed my wagon and harness, and got all my bedding and provisions, and run me and my men off the place.

Q. Do you know anything about the cause of that conflict?—A. Only from what the Indians say themselves. They say it was on account of

starving to death. They said they could not get anything to eat on the the reservation.

Q. That is what they said?—A. Yes, sir. I heard one Indian say he was entitled to two pair of blankets, and he said the agent cut a blanket in two pieces, and then give them a half of one.

Who was that agent?—A. Rhinehart, the agent at Malheur Agency.

By the CHAIRMAN:

Q. You are of the opinion that if those Indians had been properly treated there would have been no war?—A. Yes, sir; I think so.

By Mr. BOONE:

Q. Up in that neighborhood where this conflict took place, is that in Oregon?—A. Yes, sir.

Q. Are the Indians living off the reservation and also those upon the reservation there?—A. They are not living in Oregon so much off the reservation as in Nevada. At this Malheur Reservation a good many more Piutes are off the reservation than on. I have had some of them to work for me for three or four years.

Q. State whether or not those off the reservation took any part in the war, or was it confined exclusively to those from the reservation?—A. Yes, sir; I do not know of an Indian off the reservation joining the hostiles. I had a boy Piute with me during the fight, and some of his Indians were with the hostiles. He was as afraid of them as I was.

Q. It was the reservation Indians engaged in the difficulty?—A. Yes, sir; they had passes to hunt and fish. They had guns which were furnished, as I understand, by the agent.

Q. Up in this country, do the Indians off the reservation, and working about as they can get it, and farming for themselves, get along pretty well?—A. They are doing better over there than those on the reservation, so far as my observation goes.

S. F. TAPPAN sworn and examined.

By the CHAIRMAN:

Question. You heard the questions asked of the other witnesses. Whatever you may know in regard to the management of the Indians on this side of the mountains we should be very glad to hear. How long have you lived in this country?—A. Three years ago I came to the Pacific coast.

Q. Have you had any business with the Indians?—A. I have had a great deal of business with them for twenty years, east of the mountains.

Q. In what capacity?—A. I was in the Army and had command of troops posted in the Indian country on the plains, and after the war I was a member of the Indian peace commission that made all the treaties; Generals Sherman, Terry, Harney, were of the commission. Previous to going in the Army I was in Kansas. I went to Kansas in 1854, and had more or less intercourse with the Indians in that State. And then I have traveled up and down the coast up into Alaska, over Oregon, and up into Canada. I think I have about all the information one can get by traveling.

CIVIL LAW SHOULD BE EXTENDED OVER THE INDIANS.

Q. State to the commission, from your observation, what you think would be the best policy to pursue with those tribes.—A. I have but one remedy for the whole Indian question, and that is to extend civil law

over the Indians of the country and make them amenable to its penalties as well as to have its protection. The Indian to-day is practically an outlaw—an outlaw cannot commit a crime. He has no recourse for redress of grievances but war, and he goes to war. In our report signed by Sherman, Terry, Harney, and others, in 1867, we practically exonerated all criminality of war up to date, for we found they were never the first to go to war, and never went to war without cause. They have got to extend the law over that country or remove them to the Indian Territory where they are protected. It don't make any difference whether the Army or civil authorities have control. I would prefer the Army for the reason that they have more power and are more efficient and the officers are men of honor and have some self-respect. In a measure I favor the removal, and on the whole it would be better; but they do not have half enough power.

Q. You think the military should have more power. Do you think that the military should have authority to punish and to go to war with the Indians regardless of the orders of the civil authorities?—A. They can protect the Indians better than anybody else.

Q. Are they not required at present to protect them? You mean to locate them near them for that purpose, do you?—A. Yes, sir. I suppose when I was in the Army that I assumed more than a military officer should.

THE TRANSFER SHOULD BE MADE.

Q. I take it from the status of the question before Congress that when they ask us to decide whether or not it would be better to transfer the management of the Indian Bureau from the Interior to the War Department that they do not view it in the light of giving the military authority to go on and raise war and prosecute, &c., independent of the civil authorities; but that it is simply to turn it over to the military because, probably, of their better system of doing business, and that they would do the clerical labor at the agencies.—A. They do it better. The Indian is sure then of getting his annuities and goods. I do not believe for one that they have any surety of getting it under the old system. I believe the country wants to be relieved of the necessity of Indian wars that are expensive and dishonorable.

General O. O. Howard telegraphs as follows, under the date of September 29, 1878:

Outrages on Indians.

General O. O. Howard telegraphs from Fort Vancouver that an Omaha Indian was murdered on the 29th ultimo by white men, and that the Umatillas have within three weeks lost 500 horses, taken by whites. He asks, "Cannot the United States district attorney be instructed by the Attorney-General to attend to this and other cold-blooded murders of Indians by white men? A few examples of such justice would do more for peace than a whole summer's campaign." The foregoing was indorsed by General Sherman as follows: "The Umatilla Indians should be protected in their lives and property as far as possible by the civil agents, as also by the military; but after crime is committed the civil courts should try the case and adjudge the measure of punishment." The dispatch thus indorsed was sent by Secretary McCrary to the Indian Bureau to-day, and Acting Commissioner Leeds has referred it to Secretary Schurz.

The Indian could not be protected now, and never has been, and all the trials of white men for outrages upon the Indians are a farce, and have been from the settlement of the country up to the present time. The Indian is high-spirited and courageous, and he will not submit to these things, and of course he goes to war. It depends upon Congress to protect them.

I went up into Canada to look into the matter up there, and it was reported by the secretary of state in his official correspondence at

Ottawa that for 200 years they had never had any trouble with the Indians, and I traced that back by the record to the treaty of capitulation by the French. They refused to surrender that country to the English in 1840 unless the British Government would protect the Indians as other subjects of the crown of Great Britain. That was accepted by the King, and he issued a proclamation commanding all the governors in those possessions, "inasmuch" as, he says, "peace cannot be expected with our Indian wards unless they are protected, you are hereby commanded by the King to extend and do all in your power to secure to the Indians equal protection under our laws." And from that day to this they have done it. The result is white men cannot rob Indians with impunity—cannot kill his horses or him.

In this country any scoundrel can get up an Indian war that costs this government millions, and there is no help for it. There is a remedy, but it is not extant yet. There must be something done for the good of our people—the frontier people, who are the greater sufferers. They lose their lives and their property, and it is all traceable to this want of policy on the part of the government.

By Mr. BOONE:

Q. You are aware of the method of conducting Indian affairs at present under the Interior Department?—A. Yes, sir.

Q. You are aware that there is a bill before Congress looking to the transfer of the management of the Indian Bureau from the Interior to the War Department, of course, with a view to carrying out treaty stipulations and purchasing and transporting and issuing of the supplies to the Indians. You have been an Army officer, and you are acquainted with their method of doing business. We want your opinion, if we should continue this policy, whether or not it would be better for the Indians as well as for the government that the War Department should take charge of their management than it is under its present administration?—A. Or continue the Indian under the present administration?

Q. Yes, sir.—A. I should decide in favor of the Army, decidedly.

Q. If an Army officer should be detailed as agent, and the clerical duties of the agency devolve upon him, state whether or not he is equally as well qualified to attend to these duties as a civil agent.—A. Certainly. It is rather demoralizing to the Army. I do not think they would be benefited by that service. Outside of the Army I think it is better for the Indians, for the country, and for the people that they should disburse the money and adjudicate upon all matters. Army officers can under a stress of circumstances have a drum-head court-martial. I used to treat white men who stole horses as horse-thieves, and I did not care whether they were black or white, I would put them in irons. The result was I got peace with the Indians from Fort Union to Fort Laramie, and that road was just as safe for people as any street in this city. I was ordered East. My successor maintained the same policy and there was no trouble. Soon after Anthony took charge of those Indians, and the result was the Sand Creek massacre, and the result of that was war, which cost many millions of dollars and hundreds if not thousands of lives.

ACCOUNTABILITY OF ARMY OFFICERS.

Q. State whether or not the system of accountability which is adopted by the Army is not very close and scrutinizing, and is it not next to impossible for an officer to misappropriate money without detection?—A. I think it is.

Q. State, if you please, whether or not if there is any difficulty with the civil administration the Army is always required to be in the Indian country and settle it?—A. Yes, sir.

Q. Is that double system of jurisdiction or that divided jurisdiction beneficial to the country, or would it not be better for one department or the other to have entire command of the question?—A. Well, that is a question. It is a muddle any way—the whole system—and as long as it continues there is continual outbreak and trouble.

Q. I mean this, if the Army is required to be there at all—and you have stated that Army officers are as well qualified to administer the clerical duties as civilians—would it not be better if the whole question was delegated to the War Department rather than that you should have the Army there to perform one duty and a civil agent to perform another?—A. I do not see any difference as far as the administration of affairs at Washington is concerned whether the order is given by the Secretary of the Interior or the Secretary of War. Here, in contact with Indians, the enforcement of that order could be much more effectually accomplished by an officer than a civilian.

Q. Army officers are better acquainted with the Indian character than the civilians who live in the States?—A. Certainly.

Q. And is he not better qualified to treat with them?—A. O, yes, by all odds. When the peace commission had its last meeting at Washington, we voted first to recommend the organization of a separate department for Indians and the enactment of a code of laws and the establishment of a government for all Indians that now exist in the Indian Territory. Failing in that, I voted that we recommend that it be transferred to the War Department. When I was down in New Mexico General Sherman and myself were suing with the Navajoes and Utes, and we found Congress was likely to adjourn without making an appropriation. So I hurried on to Washington to meet the joint committee to urge them to appropriate two millions of dollars to carry out the stipulations of those treaties, and place it in the hands of General Sherman for disbursement, which was done. He immediately sent Harney north to Nebraska and General Harrison south into the Indian Territory. We calculated to concentrate in this territory, north of Nebraska, 52,000 Indians, and in that territory south of Kansas 82,000, and then set apart a territorial reserve—not a reservation, but a territorial reserve in the Rocky Mountains for the Navajoes, Utes, and all Rocky Mountain Indians, and then come out here and have another territorial reservation and give the Indians the choice of one of these four reservations. Congress rather repudiated our treaty, and took the ground that no appropriation should be made, and that complicated matters somewhat. The House refused for some time to make the appropriation. The laws we recommended should be passed were never passed. We secured peace; we saved millions of dollars every week by stopping the war. Our messengers went into the hostile camps and brought the Indians in, and we closed out the war and saved the money. But the delay of the appropriation brought it back to the old state of affairs; and I can only say that while the Indians got every cent of that two millions of dollars, it went where it ought to have gone. If that had continued we would have them all there and the trouble ended.

Q. Have you any different system from the present reservation and annuity system which you would like to urge upon the attention of Congress and would like to acquaint this commission with? If so, we would like to have the benefit of your remarks.—A. I can best answer that question by offering a printed interview. I was interviewed two years

ago upon this question and I advocated the English system. Wherever the English army goes it extends the protection of the law. That enabled England, with sixty thousand troops, to conquer India with two hundred millions, and govern it successfully. In Canada it was the extension of the law over the Indian country that secured peace.

Q. I understand that system simply embraces the extension of civil law over the Indians as well as over the whites?—A. Yes, sir; the same thing.

[From the Daily Press, Philadelphia.]

The red men—What shall we do with them?—Interview with Col. S. Forster Tappan, of Oregon—An ex-peace commissioner urges the necessity of extending the civil law over the Indian Territory—A lesson for the future from the history of the past.

Latest advices from the frontier prove beyond a doubt that we have entered upon another Indian war, which, unless quickly decided in our favor, must, like all former campaigns of the same nature, continue with all the attendant horrors of such a struggle until hundreds and perhaps thousands of lives have been lost and millions of dollars spent without gaining more than a temporary cessation of hostilities. Experience has proved that neither wars nor treaties have any lasting effect for good and the unanswered question, What shall be done with the Indians? again recurs. Learning that Col. S. Forster Tappan, formerly a member of the Indian Peace Commission of 1867–'68 created by act of Congress, could be found in the Oregon department at Agricultural Hall, a representative of this journal called upon Mr. Tappan on Saturday, and, after the usual interchange of courtesies, requested some expression of his views on the relation of the government to the aborigines. The gentleman kindly consented to make a statement of the situation as seen from his standpoint, and when asked how long he had been familiar with the subject, replied:

"Twenty-two years ago to-day I pitched my tent on the present site of Lawrence City, Kans., and became one of the few settlers at that time of the Territory, and remained there the six years following, during which the free-State men were in constant peril, practically outlawed, hunted like wild beasts, liable at all times to be pounced upon by the people from 'over the border,' murdered, and their property destroyed. The condition of the people during that period was similar to that of the Indians to-day. A peaceable assembly on the ever-glorious Fourth of July was surrounded by the artillery and cavalry of the Regular Army, and a colonel in full uniform entered our midst and dispersed us at the point of the sword. The same troops were employed in hunting free-State men, arresting, putting in irons, and driving them in their chains over the prairies—imprisoning the most prominent citizens for months, the United States courts refusing to interfere for their release and give them a trial. Like the Indians, our people had no tribunal for a redress of their grievances or for their protection, except that of actual war against the pro-slavery aggressors. The fact that they should resist occasioned as much surprise to our enemies as the recent resistance of Sitting Bull to the attack upon his people does to-day to his. The United States House of Representatives interfered in our behalf by refusing to pass the Army appropriations except with a proviso that the Army should not be employed to subjugate the people of Kansas, and adjourned. President Pierce immediately convened them in extra session and forced his measure through in the interest of slavery. Fortunately, the election of Mr. Lincoln ended the conflict, and Kansas became a free State, sending nearly twenty-five thousand men to the front to save the Union, and is now a prosperous, populous, and glorious commonwealth."

REPORTER. Did you remain in Kansas all that time?

Colonel TAPPAN. Yes, and was an eye-witness to much that I assert, but remember, I am only using the State of Kansas at that period to illustrate the condition of the Indians at present, but I will speak more particularly of them in a few moments.

"When did you leave the State?" was the next question.

"In the summer of 1860, going to Colorado," answered the colonel, "and there found about 10,000 people in much the same condition as the Indians; murders of frequent occurrence; a reign of terror, and the people forced, as their only means of self-preservation, to the terrible extremity of vigilance committees. No courts, no law, nothing. The next year a regiment of volunteers was called into the public service, about whose first duty it was to rid the Territory of the roughs and secessionists, establish order, and enable the civil authorities to enact and enforce law. To do this I was forced to disarm Denver to supply my men, and arrest several persons. Then a neighboring Territory was invaded from Texas, the Regular Army defeated and imprisoned in Fort Craig, and the enemy in possession of nearly the entire Territory. The Colorado volunteers flew to the assistance and rescue of the Federals, and taking one hundred wagons of stores, determined to cut through the enemy and succor our men. The two forces met in a narrow mountain pass, and after seven hours' severe fighting the Confederates

were defeated, we losing 10 per cent. of our men. By this move, however, we did what 7,500 troops under General Mitchell were making forced marches across Kansas, and 2,500 under General Carlton were coming from California to accomplish, yet the rescued commander of the department never in any of his reports up to the day of his death mentioned the regiment that saved him."

REPORTER. During this time were you brought in close contact with the red men?

Colonel TAPPAN. I had abundant opportunities to study their character, and when it became my duty to command posts and troops in the Indian country among the Indians of the plains and Rocky Mountains, I always treated them like men, not like savages, and consequently had no trouble.

REPORTER. Perhaps you were thrown among some remarkably peaceful nations of red men?

Colonel TAPPAN. They included the Utes, Comanches, Apaches, Cheyennes, and others of the same warlike nature; but I will briefly sketch my greatest experience among the Indians, and then you will conclude that if I do not understand them it was not for lack of opportunity to learn. After the war, as a member of the Peace Commission, I traveled over the Indian country east of the mountains, from Forts Sully and Laramie in the north to Fort Sumner in the south, meeting nearly all the tribes in council, including the Sioux, Cheyennes, Comanches, Navajoes, &c. Last year I crossed and recrossed the continent, visited nearly every port from San Diego, Southern California, to a point nearly 250 miles north of Sitka, Alaska, traveled over Oregon and California, through Nevada, Utah, Colorado, &c. During these last twenty-two years I have met and associated with Western explorers, mountaineers, pioneers, soldiers, missionaries, Indian chiefs, hunters, &c., and am somewhat acquainted with them, among whom may be mentioned Governors Charles Robinson and William Gilpin; Generals Sherman, Sumner, Howard, Harney, Thomas, Terry, Canby, and Augur; Colonels Kit Carson and William Bent; Bishops Whipple and Lama and Father De Smet; Chiefs Moketavata, Little Raven, Red Cloud, Santanta, and scores of others, and I think I know them and their views of the Indians. I have thus briefly outlined my experience to convince you that I can without egotism assume to know something of the West, something of its people, their necessities, privations, and sentiments, something of the Army, something of the Indians and the Indian country.

REPORTER. What, then, in your opinion, for you should have a settled one by this time, is the cause of all these Indian wars, and what do you believe to be the remedy?

Colonel TAPPAN. In 1865, while in the Army, I was summoned to Washington by a joint committee of Congress upon Indian affairs, and that same question asked me. I answered, simply because the Indian is an outlaw, and the only remedy is in the extension of our civil law over the Indian country. A member of the committee afterwards told me that I was the first to allege such as the cause and suggest such as the only remedy. They, however, accepted it as the correct one, prepared an act to secure it, which passed the Senate by a considerable majority, but was killed in the House through the persistent efforts of a member from Ohio. Had that act become a law and its provisions enforced it would have ended our Indian troubles long ago.

REPORTER. I remember the debate, and when the Peace Commission was afterwards created, supposed that the difficulties would be satisfactorily adjusted on some similar plan.

Colonel TAPPAN. This commission began its labors in 1867, when war, attended with fearful loss of life and treasure, again existed on the plains. The body consisted of civilians and Army officers. Among the former Hon. Mr. Henderson, of Missouri, chairman of the Senate Committee on Indian Affairs, and among the latter General Sherman. This commission journeyed all over the Indian country east of the Rocky Mountains, and met all, or nearly all, of the several tribes in council, experiencing no difficulty whatever in meeting even those who were at war—the Cheyennes and certain bands of the Sioux. With all of them treaties were made, which the Senate afterwards ratified, and the House for a time repudiated as null and void. The commission reported as the cause of trouble with Indians the fact that they had no other tribunal but war in which to obtain redress for wrongs done them, and in which to secure protection for the future. This commission urged certain legislation as absolutely necessary to secure an honorable and permanent peace with the wards of the nation. President Grant has frequently urged the same thing upon Congress during the last seven years, but nothing has been done. I never could understand why the President submitted, especially after his Indian policy had been indorsed by the Republican convention that renominated and by the people who re-elected him, in allowing Congress to adjourn term after term without action upon this important subject; why he did not do as much for this as Pierce did to force slavery upon Kansas? He has but one more chance; if he allows that to pass his administration of the office will pass into history as one full of good promises but in performances nothing. Old Hickory would have done differently. Our only safety for the future is to adopt the English policy of extending the civil law to all over whom the flag floats. It was done in Canada upon acquiring that territory from the French in 1740, and is now done in In-

dia, which enables England, with an army of only 60,000 troops, to govern that vast territory, with an area of one million square miles and a population of 200,000,000 of people. From the lectures on the "Early History of Institutions" by Sir Henry Sumner Maine, you can soon learn how the English acquire wild territory, organize society, and civilize a wild people, and it will be seen at a glance how different it is from our own methods. I have one or two extracts in my desk and will show them to you.

Colonel Tappan here excused himself for a moment, and returning read the following:

"*Even in our own day* [Maine is now living and lecturing], *when a wild province is annexed to the British Indian empire there is a most curious and instructive rush of suitors to the courts which are immediately established. The arm of the law summarily suppresses violence, and the men who can no longer fight go to law instead, in numbers which sometimes make Indian officials believe that there must be something maleficent in the law and procedure which tempt men into court who never saw a court before. The simple explanation is, that the same natural impulse is gratified in a new way; hasty appeals to a judge succeed hurried quarrels, and hereditary lawsuits take the place of ancestral blood-feuds. If the transition from one state of society to another in modern India were not sudden, but gradual and slow, as it universally was in the old Aryan world, we should see the battle with technicalities going on in court at the same time that the battle was waged out of court with sword and matchlock.*"

Continuing his conversation, he said:

"We acquired years ago a considerable territory from Russia, known as Alaska, an area of 500,000 square miles, about half the size of India, and a population of 70,000, who are now under the ban of outlawry—no civil law, no civil courts, and no civil officers, except to collect the revenue. There will be trouble there some day. The English place their wards above the mere caprice of a military officer, and the power of the government secures them protection in spite of the officer and in spite of the sovereign, while we do not, and as a consequence the Indian is outlawed, our pioneer settlers compromised and imperiled, and our Army placed in a false position before the country and the world. Our policy rivets one end of a chain about the necks of the Indian race and the other end about our own."

REPORTER. But it is said that it is now impossible to have peace with the red men, for they cannot be trusted.

Colonel TAPPAN. Whether the Indian is a saint or the greatest of sinners, whether we made him what he is or he made us what we are, is neither here nor there, and has nothing to do with the question at issue; he is here, and will fight upon every provocation; goes to war because hunted like a wild beast; his wife and children are murdered, and this broad land affords him no tribunal in which to redress his wrong and obtain protection for himself and those dependent upon him; so he goes to war, and by that means he has from the first saved his race from slavery or extermination and rescued our people from the greater crime of its enslavement or destruction. We may continue to denounce him, as the Roman populace denounced Sparticus, one of the world's heroes to-day, but that did not prevent the escaped bondman from destroying army after army sent against him. Neither will our loud and bitter words either disarm or discourage the Indians. If the Indian is as black as painted, what business have American Army officers to employ them as allies? Even the unfortunate Chivington refused to do this when leaving Denver to destroy the Cheyenne village. Their self-respect should prompt them to refuse the services of all such. Wellington, the "Iron Duke," upon the frontier, about to enter France in pursuit of an army he had driven out of Spain, disbanded and sent to their homes one wing of his army (nearly one-half) because he could not prevent them from committing depredations upon the persons and property of the enemy. To-day our Army, with its Indian allies, are in the field against the Sioux. This subject is inexhaustible, but it all resolves itself into the fact that the Indian is outlawed, and as a consequence we continue to gather a harvest of death and dishonor. This is written in blood from Plymouth Rock to the extremes of the continent, south of the Canadian boundaries, and now glares at us from the western sky; yet we do not profit by it at all, to simply apply the remedy, a remedy in our hands only—*the extension of the civil law over the Indian country.*

INDIANS CAN BE MADE SELF-SUSTAINING.

By the CHAIRMAN:

Q. Are you of the opinion that the Indians can ultimately be made self-sustaining, and that they would become good citizens?—A. Certainly; there is no difficulty.

Q. You state that the business could be done to very much better advantage by the military department than by the civil department. Did you confine that remark to the clerical part of the duties—to the payment of money and annuities, &c.—or did you intend to say that

they are better qualified to teach them the art of agriculture and farming?—A. There is no teaching of that kind now to amount to anything. If our treaties were carried out in good faith there would be no difficulty.

Q. You stated that you believed the Army officers were better acquainted with Indians and their needs than citizens. Do you mean that the education of the military officer, before coming in contact with the Indian in the Indian country, has better qualified him, and that the training at West Point gives him any knowledge of Indian affairs?—A. I do, most assuredly. It gives him better ideas of business. Being a graduate of West Point, everything else being equal, he would be much better qualified than a man who had never graduated anywhere.

Q. I supposed a graduate of that place was a graduate in the science of war and general information, but not acquainted with any tribe or class of people especially; that Army matters applied to Army business rather than any particular acquaintance with a certain class of people, red, white, or black.—A. Education gives a man a comprehensive idea of things.

Q. Could not a man be educated outside of West Point and be competent for such duties?—A. Yes, sir; but such men do not very often accept Indian agencies. I do not believe any man in this country that would accept an Indian Agency simply for the salary attached to it is really competent to do the business. There may be men actuated by other motives who will take it, but in my opinion whoever will take it for a livelihood, or for the salary attached to it, I do not think is competent.

INDIANS OPPOSED TO RESERVATION SYSTEM.

Q. I wish to know why a military man is better qualified to manage Indians, without knowing anything about the Indians, than any one else who is equally qualified in education and other advantages.—A. I do not recognize any difference between Indians and any other people. Their human nature is about the same, whether white or red, and everybody who can get along with the white people cannot get along with Indians. They are very sensitive to wrong. They will not submit, like some other races, to outrage. They are always ready to defend themselves. The reservation system as conducted is rather a prison and they feel it; it confines them; and therefore they like to break out of it, as we or anybody else would. We would want to get out of it, and they have the same feeling. They want to get out of it also. The Modocs up here made several attempts to become citizens, but they could not. There is no law that will enable them to be citizens, and the result was an outbreak, and war costs a great deal of money. Those removed to the Indian Territory are doing very well, sustaining themselves and contented. Senator Howard told me that there were 8,000 Indians in his State, 7,000 or 8,000 United States citizens voting, and no longer reckoned as Indians. They were good citizens. In Kansas, among the Pottawatomies, they naturalized 125 in one year. They are also citizens, and are no longer spoken of as Indians.

Q. How far would you advise Congress, in regulating the Indian affairs, to allow or authorize the military department to conduct the management of affairs at the agency? Would you authorize them to punish for offenses, even to following the Indians up in the field, or only as to local punishment?—A. Local punishment. Now, if an Indian commits an outbreak, the whole tribe are held responsible and war is the result, when it is an individual matter. The officer would have to exercise great discretion in that matter in order not to force the tribe on the war-path.

POWER NECESSARY TO BE GIVEN TO THE MILITARY.

Q. Your advice would be to extend the civil law over the Indians. I can see where that would apply to those we call civilized or semi-civilized. Would you advise that, or is it your opinion it would be better for the management of the Indians that the laws extend to all, or only to those claiming civilization? Would you take in the blanket Indians as well as the other?—A. In the Indian Territory I presume there is no necessity for any troops. The Cherokees and Choctaws manage their own affairs, I suppose. But on the scattered reservations, like the Umatillas, you should give General Howard power enough to recover those horses from the white horse-thieves and punish them for murdering those Umatillas. I have discovered in this State a better feeling toward the Indian than in any other, and I account for it for the reason that in early days the Californians went all through the State prospecting for mines, and came in contact with the Indians, and acquainted themselves with their habits, and consequently they can get along better with them than up in Oregon where they have been kept on reservations. There is antagonism existing all the time.

Q. According to your own knowledge of this Umatilla difficulty, you think it was brought on by the bad treatment on the part of the whites?—A. They have not been on the war-path.

Q. Were not a portion of them on the war-path?—A. I think not; they were the Bannocks and the Nez Percés, Joseph and his band.

Q. What were you speaking of then?—A. I was alluding to the Umatillas, with whom we have had no trouble, but are looking for trouble, because General Howard cannot protect them. They have been robbed of 500 horses.

Q. He cannot protect them from the whites?—A. No, sir; he cannot protect them against horse-thieves, who went there and ran off 500 horses.

CIVIL LAW SHOULD BE EXTENDED OVER THE INDIANS.

Q. You advise that laws be extended over tribes like that and the same punishment allotted to the Indians and whites alike?—A. Yes, sir. When on to Washington in 1865 I was asked this question, and I there stated the cause of the difficulty and the remedy. They were accepted as true. Senator Doolittle and Mr. Foster, members of that committee, brought up a bill and it passed the Senate by eleven majority, and went over to the House and was advocated by the chairman of the Indian Committee, and was defeated through the efforts of Mr. Schenck, of Ohio, by three majority. If that law had passed it would have been the end of all our Indian troubles. When we made our report, a bill was drawn up to establish a Department of Indian Affairs. That was recommended by all the members of the commission. That provided for a local government, and the concentration of all these Indians on the four or five reservations, and ultimately on one, and that they should have government, and civil courts, and the whole thing in a system precisely as among the whites.

Q. Give us your opinion as to whether or not you think it would be advisable that courts be established now?—A. Certainly, that is the only thing that will settle the difficulty. Take up either of those bills and you have settled it for all time. There is no other way I can think of. The mere transfer to the War Department don't amount to anything.

Q. It only prolongs the question?—A. Yes, sir. It is a question above all that; it is a question of citizenship, of protection, of breaking up this

outlawry which the Indians have suffered from for centuries, and it must be broken up before we have peace. We have no right to expect peace until it is. The idea that an old horse, worth thirty dollars, costing this government forty millions dollars and twenty-five hundred lives, and an old cow being the cause of a war costing four millions dollars. Both of these cases we referred to. That is an absurdity. Such things a great republic like ours ought to be ashamed of. Lieutenant Gordon went down and demanded the cow. It had been killed, and they gave up the hide, and he shot some of the Sioux; that resulted in the war of 1854. This gray horse was the pretense for the Cheyenne war. General Harney, who was in the Seminole war, said it could have been more easily settled before a gun was fired than after. The seven years of the Black Hawk war was the same. The record is black enough, God knows, and it is time to wipe it out. If you cannot do better, put these Indians down in the Indian Territory where the Nez Percés and Modocs are. There is room enough on the other reservations for them. As soon as the Indian is protected under the law, and has the same possessions that anybody else has, he will work among the whites here, there, and everywhere, and scatter out. The Indians and white men get along very well. Up here in Oregon, if they go to work for a farmer, they are caught and forced back on the reservation.

LAND SHOULD BE INALIENABLE FOR A PERIOD.

Q. State your opinion to the commission whether or not you would advise that they be suddenly changed into the relations of citizens and of holding property in severalty, or whether you would let that be accomplished by degrees.—A. I would secure that at once; that is, I would start out to secure that at once. But there should be a period of twenty years before it could be fully brought about, or accomplished. We cannot declare at once that every Indian should have 160 acres of land in his own name. They should have time to carry out and make the selection.

Q. Have you anything further to offer to the commission?—A. Nothing that I think of at present.

SAN FRANCISCO, CAL., *October* 31, 1878.

E. S. WOOG sworn and examined.

By Mr. STEWART:

Question. What is your occupation?—Answer. I am a first-class clerk in the Indian Office at Washington.

Q. What is your business here?—A. Special agent to purchase goods for the Indian agencies on the coast.

Q. How many agencies are there in this State?—A. Three; Hoopa Valley, Round Valley, and Tule River.

Q. What number of Indians have you to each of those agencies?—A. At the Round Valley Agency, there are about one thousand; at the Hooper Valley Agency, about four hundred and twenty-seven; at Tule Valley Agency, two hundred and fifty-four.

Q. That is according to the Indian Commissioner's report?—A. According to the report of 1877. There are quite a number of Indians not under charge of agents; about two thousand, I believe.

Q. Do they draw supplies?—A. No, sir.

METHOD OF PURCHASING SUPPLIES.

Q. If you will be kind enough to give us the facts relative to your purchasing supplies, we should be glad to hear them.—A. The method of getting the goods is according to law by application and contract. Each agent furnishes an estimate of what he needs, and his estimate is filled according to the amount of money at the disposal of the office.

Q. Are they advertised?—A. When the contracts are approved in Washington, the goods are shipped to the different agencies and distributed by the agent.

Q. How is the transportation done, by contract?—A. Contracts for transportation are secured in open market. There are two ways of purchasing goods, one by contract, and the other in open market.

Q. Which is the cheaper and better?—A. The law requires that everything over two thousand dollars must be done by contract. I consider it cheaper in open market.

Q. Because of the competition?—A. Because I can go wherever I want to. Open market is cheaper, because there is more competition. Many persons refuse to take contracts, or put in bids even.

Q. You may give any facts connected with the purchasing or distribution of goods.—A. One reason why supplies do not reach the agencies in time for distribution is that appropriations are made too late to let contracts to send the goods for distribution to the different agencies. The rainy season begins in Washington Territory and Oregon about the 1st of October.

Q. This is the distributing point for how many States?—A. Nevada, California, Oregon, and Washington Territory. This is only the second year we have distributed goods from this point.

Q. What are the advantages?—A. Our advantages are superior to New York, because it is easier to fill all requirements or estimates.

Q. And it is more economical?—A. Yes, sir; I consider it so, taking everything into consideration.

PURCHASES UNDER THE INTERIOR DEPARTMENT CHEAPER THAN BY THE WAR DEPARTMENT.

Q. In point of price, how do your purchases compare with those of the Army?—A. As far as I know in every case we purchase cheaper than the Army. One reason is we do not require such extensive packing in putting up goods. The sugar purchased this year for this coast was for one-quarter of a cent a pound less than that purchased by the Army, being the identical sugar purchased by the Army and from the same party.

Q. Is there anything else you wish to state in reference to these matters?—A. This being a new thing out here I do not know what testimony you wish.

Q. What amount do you purchase and distribute for these States?—A. I have about seventy thousand dollars, and distribute over four hundred different articles. The great point is to procure appropriations in time to let contracts promptly on the 1st of July, or even before. In order to supply agents properly appropriations by Congress for the Indian Bureau should be made not later than the beginning of May. All contracts expire on the 30th of June, and in order to put new contracts in operation on the 1st of July they should be let at least four weeks previous to the 1st of July. In my opinion the trouble with the Cheyennes was through lack of timely appropriations on the part of Congress. The supplies could not be distributed to reach them in time for the new fiscal year. I have charge of these agencies and I know that to be the fact.

SAN FRANCISCO, CAL., *November* 5, 1878.

JOHN P. HOYT sworn and examined.

The CHAIRMAN. The object of this commission is to ascertain whether or not it would be better for the Indians or the government, or both, to transfer the management of the Indians from the civil to the military department. That is the main object. At the same time we are taking other testimony, and we are trying to get the opinion of gentlemen of experience as to whether there is anything better than either of these methods, and, if not, which of these two would be preferable.

THE TRANSFER SHOULD BE MADE.

The WITNESS. My own convictions upon this subject (although I have never made them public) are that it would be better for the bureau to be controlled by the War Department. I would, of course, like to state my reasons for so thinking. They are these: It is not because I think civil officers are any more dishonest than military officers; not that I think there would be less stealing under the military than at present, although I think there are perhaps guards about the military that are not found under the present management. I think, in the first place, there is now a division of responsibility. If there is an outbreak the military at once say that the fault is in the Interior Department, and that they cannot keep the Indians in. Whether those charges are true or untrue, they make them. If they do not come as promptly as they ought themselves, they avoid responsibility by claiming they were not properly informed. If the Indians were transferred to the War Department they would not be able to make that excuse. They would be responsible all the time, and could not quibble about it. If there is an outbreak they will have to meet the issue. Another reason is that the War Department have perhaps as near a perfect system of purchasing and issuing rations, subsistence stores, and quartermaster's stores as can be devised, and have as many safeguards thrown about it. The Indian Department I do not think has many safeguards. Besides, if there is any necessity of a duplicate system of purchasing under the same government when it can be done by one department, I do not see it. While, as I said before, perhaps officers are as honest in one department as the other, there is perhaps more at stake in the case of the military officer than there is in an Indian agent under the present system, and perhaps he has greater incentive to remain honest than the Indian agent has.

CIVILIZATION OF THE INDIANS.

Q. How far have your Indians advanced in civilization?—A. My convictions upon that point are—at least, my impressions are—not very favorable to the Indians in Arizona. I do not think their advancement towards civilization is as great as it ought to be if the theory as to their ultimate success is correct. The Papagoes have always been at peace with the whites. They claim they never killed a white man. They live near Tucson. I do not know that they are more civilized than a hundred years ago.

Q. Do they use the blanket?—A. A few of them dress in citizens' clothes, but a majority of them continue their native dress. One thing, they have got to cutting their hair and wearing hats quite extensively. That is the most marked evidence that there has been any improvement among them.

LAND SHOULD BE HELD IN SEVERALTY.

Q. Have you made up your mind on the subject of dividing the property and holding lands in severalty?—A. Yes, sir; I have thought some

thing of that. I think, in my judgment, when circumstances are such that it can be brought about, that it is the better solution of the problem to give the Indian land and hold him responsible to the laws, the same as other people. I do not wish to be understood as saying that that is practical under all circumstances. I do not think they are so far advanced in all cases that it can be done. But I think many tribes existing at present as tribes could be induced to give up tribal relations.

INDIAN POLICE SUCCESSFUL.

Q. You have some who have advanced further than others?—A. O, yes; I suppose so. At the San Carlos Agency there has been some advancement made. They have adopted the system there of Indian police. I guess that was about the first agency to put in successful operation the idea of making Indians govern themselves by means of Indian police under charge of white men. They are now governed on the reservation. When they go off the reservation it don't succeed, for as soon as they have trouble with white men, white men will not bear to be interfered with by those Indian scouts as they will by the military. They will not obey any reasonable request of the Indian scouts as they would of the military commander. So far as governing the agency, it has succeeded well. I am of the opinion that many Indians might be profitably incorporated in the Army, and they might in that way get rid of the most dangerous bucks by incorporating them in the Army, not as scouts by themselves, but making them soldiers. I do not know, of course, whether it is practical or not, but I have been a good deal impressed with the idea that it might be entirely practicable.

By Mr. BOONE:

Q. Where have you recently lived, and what has been your position?—A. I have recently lived in Arizona. I went to Arizona in 1876 as secretary of the Territory, and in April, 1877, was appointed governor of the Territory, and was relieved as governor of the Territory on the 5th of October last.

Q. You are therefore, to some extent, familiar with the condition of all the Indians in that Territory?—A. I have a general knowledge. I wish to say what I said to one or two members of the commission before coming in here, that I am not as fully advised as I think the governor of a Territory ought to be as to the movements at the Indian agencies and of the Indians themselves, and I think in that respect the law ought to be changed so that governors of States and Territories where there are Indian agencies should be informed by the agents as to the important events happening at the agencies. I think such ought to be the duty of the agents under the law, and I think it would be even wise that all his reports should pass through the hands of the governor; but that I would not be particular about. I think that would be a wise thing.

Q. Would you deem that advisable if the management were turned over to the War Department?—A. It would not be necessary at all that the officers who are in charge of the agency should make any report to the governor, but of course it is necessary that there should be harmonious action, that information could be obtained through the military authorities in charge of the State or Territory, and it would not be necessary for the military officers acting as agents to make the report to the governor. My former observations were in view of its remaining under the Interior Department. Very frequently questions arise which the military department cannot meet, and the Interior Department frequently will act more promptly on information from the governor than they will from the agent directly. The governor is not informed, and

cannot, I understand, ask for any information. If he is informed he can at any time correspond or telegraph to the Interior Department and frequently bring about results.

Q. Was any trouble averted while you were governor of the Territory by communication of the authorities with the governor of the Territory? And if so, state by whom the information was furnished.—A. One instance which is very marked I have in mind. I think it was about August when this incident occurred. The supplies for the present fiscal year did not become available in time, and the ordinary contract supplies had not reached the agency and were not available. The agent at San Carlos was unable to purchase. He got out of rations and the Indians were threatening to leave the reservation, when General Wilcox became satisfied that there was serious trouble, at least a probability of serious trouble, unless some rations were obtained at once and issued to the Indians. General Wilcox came to me and stated these facts. Wilcox commands the department. He stated that he was in correspondence with the department, and had tried to have something done, but had not up to that time succeeded, and asked me to see what I could do with the department. I at once opened telegraphic correspondence with the Interior Department, and succeeded the next day in having money placed to the credit of the agent, I think both there and at Tucson. I received the information on Friday, and Saturday I accomplished my purpose. The Secretary informed me he had directed that money be placed to the agent's credit, whereby he was able to purchase rations. Wilcox also issued flour from military stores, and took the responsibility, trusting to the agent to pay him back, and in that way, what at first appeared to be serious trouble was averted.

Q. You think that trouble was averted by this prompt action upon the part of the military?—A. Yes, sir; I have reason to think so.

IF THE ARMY IS INCREASED LET IT BE BY INDIANS.

Q. In speaking about incorporating the Indians in the Army, is it your idea to increase the Army that much, or to make them soldiers in place of recruiting more white men?—A. I am not prepared to say whether the Army ought to be increased that much or not. I am not sufficiently posted, and would not like to express an opinion as to whether the Army ought to be increased by the Indians or not; but I think if the Army is large enough they should be taken in place of soldiers when there is any recruiting. If the Army should be increased let it be increased by the Indians.

Q. If there is any increase you think it would be well to increase from among the Indians?—A. It strikes me they can be made very good soldiers.

Q. Would you place them under military officers?—A. I would place them under military officers.

Q. You don't mean to say just simply send a company or two of Indian soldiers in a country to conduct its military operations?—A. No, sir. I do not think they will make good soldiers independent of white men. I do not think they are reliable enough. I think, with the moral support of white troops, that the Indians would make safe soldiers; say in proportion, about two Indian soldiers to three white soldiers. I think that is about the proper proportion; not less than that. I think it would be safe to trust them with military backing—two Indians to three white men.

Q. From your knowledge of the Indians, do you believe they will be willing to bear the hardships of military life?—A. Perhaps they could

not be made soldiers in every sense. I do not think they would be good fatigue men. It would be hard to get work out of them. But purely for soldiers' work, of scouting and fighting, I think they would do well. It is best to keep them employed all the time, pretty generally in the field.

TRIBAL RELATIONS MUST BE BROKEN UP.

Q. Upon another subject. Is it your opinion that they are inclined to take to agricultural pursuits and habits of civilized life?—A. Some of them.

Q. As a general thing?—A. As a whole, my opinion is (and I give you only my opinion without really having any reason for it), my own conviction is that it is a perfectly hopeless task to get them to support themselves by agriculture so long as they keep up their tribal relations. If their tribal relations are entirely done away with, and each Indian made responsible for himself, I should have greater hopes of their entering land and working it.

Q. Is the incentive of citizenship sufficient to induce the Indians as a tribe or as a nation to adopt civil pursuits, or do they more readily take up these pursuits from a little compulsion?—A. I do not think they have naturally a disposition for these pursuits. I think they adopt them rather than something worse. My convictions have changed very materially since living in Arizona. I was very much of a worshiper of the Indian character until I went to Arizona. I am not so much a worshiper of the Indian character as I was. I have no doubt that in nine cases out of ten the immediate cause of outbreaks is the fault of whites themselves. What is the remote cause no one can tell. The immediate cause of all these troubles is where white men are inclined to encroach upon what the Indians conceive to be their rights.

CIVIL LAW SHOULD BE EXTENDED OVER THE INDIAN.

Q. State whether or not you think it would be to the mutual advantage of the government and the Indians to extend the jurisdiction of the laws over them, and to bring them as near to citizenship as possible and accountable to the laws?—A. I think it would be beneficial to do so as far as possible. I do not think it is possible in every tribe. Wherever practicable, it is the most feasible solution of the question. As rapidly as circumstances will allow, do so.

Q. You would have them under the restraints of law?—A. Yes, sir.

Q. And at the same time afford them the protection of the law?—A. That is my idea.

WHITES INCLINED TO ENCROACH UPON THE WHITES.

Q. In other words, at present do not you believe that the Indians need to be protected from encroachment?—A. They do in many instances; there is no doubt of it. I think the cupidity of the whites, so far as reaching after their reservations, in many instances lead directly to trouble. Of course everybody knows that the Americans, and I might not only say Americans but the entire Anglo-Saxon race, are inclined to encroach upon what they deem to be inferior people. They feel that they ought to get away and let them have their possessions. That has been the course of the whites in their intercourse with the Indians.

Q. Wherever they are civilized at all—what we claim to be civilized Indians, for instance—you think it would be beneficial to give them their lands in severalty?—A. Yes, sir.

Q. Make them indefeasible?—A. It would not do to allow them to be transferable.

Q. Permit them to hold them in severalty, and hold out to them the inducement to cultivate it as a home and permanent place to reside, and at the same time extend over them the jurisdiction of the law?—A. Yes, sir. I wish to say, further, that I do not think it would do to take away from them the sense of fear. I think the Indian is governed very largely, either remotely or otherwise, from a sense of fear. It is more that than anything else. While they apparently seem to be controlled many times from a love of keeping their word and a love of the whites, my convictions are if they did not remember what might be the result if they did not do it, that they would not be so careful. I think it is fear that keeps them in bounds. Of course it would not be so dangerous if they were divided upon farms as if they were where they could have united action. The Indian is not so likely to be dangerous when alone as when he can concentrate his action with a chief, and the chief has his pride, which carries him through.

Q. About what number of Indians have you in Arizona?—A. I made an estimate recently for the Interior Department, and I think I came to the conclusion that there were from seventeen to twenty thousand Indians. My lowest estimate was seventeen thousand and my highest twenty thousand.

By Mr. STEWART:

Q. Your views as just given are based exclusively on your knowledge and experience among the wild tribes?—A. Upon my information. My actual contact with the Indians has not been very extensive.

Q. With the wild tribes; you have not had experience among the civilized tribes?—A. I do not know whether you call the Papagoes, Pimas, and Maricopas wild Indians or not. They are not assisted by the government at all. I say not at all; they have no rations issued to them; they have little incidental expenses paid.

Q. All Indians west of the Mississippi River and known as the wild tribes?—A. Yes, sir; my observations of the Indians outside of Arizona are very limited; much more so, perhaps, than most people.

By Mr. MCCREERY:

Q. How many reservations are there in Arizona?—A. I think there are only four entirely within Arizona. Then there is one, the Navajoes, partly in Arizona and partly in New Mexico, which makes five. The Indians are hardly any of them on the reservation. They belong to what is known as the Colorado River Reservation. It may be possible that there is a little reservation above Yuma; but it is not marked on the maps, and I do not know whether they have a reservation or simply staying there.

By the CHAIRMAN:

Q. Are the tribal relations still maintained by the Indians in that part of the country?—A. Almost entirely. There are instances where Indians have severed their tribal relations, and are anxious to settle on farms and pay taxes. They are very anxious that they should be taxed and treated like white people, they say. They want to know why the assessor don't come around.

WASHINGTON, D. C., *December* 3, 1878—10 o'clock a. m.

General WILLIAM T. SHERMAN sworn and examined.

The CHAIRMAN. The object of our committee has been to ascertain the views of those who have been in one way and another connected

with the Indian service as to the feasibility of transferring the management of the Indian Bureau from the Interior to the War Department. Anything you may have to say relating either directly or indirectly to that subject would be of interest to the committee. Your communication under date of November 27, 1878, was received. The clerk will read it that it may be incorporated as a part of your testimony:

HEADQUARTERS OF THE ARMY,
Washington, D. C., November 27, 1878.

MY DEAR SIR: I am very sorry I had left the office before you called yesterday, as I could in a few words have explained one or two points of interest to you and your committee, and now prefer to write them rather than to volunteer to testify, although always ready to respond promptly to any summons from your committee. I must go to Baltimore to see my family to-day; will return to-morrow; and if deemed necessary will answer any summons for Friday or Saturday. Meantime I submit this letter.

I am sure, from official and personal intercourse, that the present Secretary of the Interior, Mr. Schurz, and also the Commissioner of Indian Affairs, Mr. Hayt, have been extremely anxious to, and have, labored hard for an honest administration of the affairs of the Indian Bureau as organized by law. I personally know that Mr. Hayt went as far as he could properly go to prevent the recent removal of Red Cloud's and Spotted Tail's bands of Indians from the Missouri River to their present locations, which must result in the *next* war just as certain as that next winter's snow will melt and the summer's grass will grow; and that their removal resulted principally from the President's promise, based on the advice of General Crook. And I further believe that both Mr. Schurz and Mr. Hayt have done all that men could do from this quarter to remove weak and dishonest agents, and to replace them by honest agents. I wish you, and if proper the public, to construe the present conflict or antagonism to be, not personal, not a question of honesty, but a natural and necessary conflict of antagonistic systems.

The past history of the colonization and settlement of America is now matter of history, as familiar to you as to me, and at this moment we are simply repeating the experience of any single year of the past hundred years; only the causes are now more active, more potent. The advance of the tide of Anglo-Saxon settlement westward has been continuous, and in 1846–'48 had reached the great plains extending from Pembina to Texas. Then we acquired by conquest and treaty the Pacific coast from Rupert's Sound to San Diego. The discovery of gold in California gave an immense impulse to migration thither, and in 1865, when the civil war had ended, the Pacific Railroad became a necessity, and emigration to the vast intermediate region followed as a matter of course. But this vast region was occupied by Indians, a peculiar race of men, well known to all, and conflicts of interests, habits, and prejudices were a necessary and foreseen result. The system of governing and controlling these Indians by civil agents and superintendents which had prevailed before since 1849, was simply extended over the new tribes with which our people thereby came in contact. Good enough for peaceful tribes, and remnants of tribes which had already been subjected by wars or conflicts with our border people, this system has proven too weak for this new strain upon its power, and the consequence has been Indian wars every year since 1865, and it requires no prophet to foresee more wars near at hand; especially with the Sioux, recently located on the Upper Niobrara. I assert that the present Indian agents with these two bands, as also with the other tribes of Sioux on the Missouri River at Lower Brulé, at the Cheyenne, Standing Rock, and Fort Peck Agencies, are utterly and ridiculously powerless to keep these Indians peaceable, as required by the interests of the national government, without the aid of the Army. The same is equally true as to the Cheyennes, Arapahoes, Kiowas, and Comanches of the Indian Territory. Nor can the civil agents protect these Indians against the unjust encroachments of the whites in the cases of the Pimas and Maricopas of Arizona, or the Umatillas and Spokanes of Washington and Idaho Territories. I name these instances simply because the Indian Bureau has in these cases called most recently on the War Department for troops to enable it to fulfill its office.

Now, to me it is matter of demonstration that at the present time, and for years to come, the Indian Bureau of itself, without the help of the Army, cannot maintain in peace the large tribes of Indians, and peace is essential to enable white emigrants to fill up the surplus country as farmers, grazers, and miners. It is not right for any man at this day to decry the emigrant, for he is the same to-day as he was a hundred years ago, willing and anxious to labor to make a home for himself and his family in, to him, an unoccupied country. You yourself have seen a great State rise and flourish on ground recently the hunting-field of the Omahas, Sacs and Foxes, Pawnees, &c. A similar class of emigrants are now utilizing the ground more recently occupied by the Sioux, Crows, and Assinaboines, and still another establishing farms and mines where the Apaches made a precarious livelihood by stealing and hunting. This process, or

progress, is bound to go on till all our public domain is allotted to use. This process is necessarily violent, but not necessarily inhuman. As a government, as a nation, we are bound to see that this change shall be made with as little cruelty and inhumanity as possible, and although nearly every officer of the Army shrinks from the amount of labor necessary, and still more from the amount of personal abuse incident thereto, they would assume the task at the beginning, rather than to bear all the kicks and cuffs without any of the power of *prevention*. With the lawful right to supervise these various tribes on their allotted reservations, and to control the issues of money and provisions provided liberally by Congress, I am sure the Army can prevent the annual recurrence of these Indian wars, which have exhausted the patience of Generals Sheridan, Pope, Crook, &c.

This is all that occurs to me as the Army side of this live question. We do not wish to transfer our Army to civilian management; we would rather do the work ourselves. Without the Army the Indian Bureau cannot manage these Indians, and in preference to being called on in season and out of season, nearly always too late to prevent trouble, or even understand the cause, but after war is actually begun, we prefer to take the whole labor and drudgery of the offices of Indian agents and superintendents without one cent of additional compensation.

Now, many kind, good people fear the blood-thirsty Army; that it will kill off these poor Indians. This is more than nonsense. The Army is made up of the same men who form our people—no more cruel, no more savage than the average of mankind. The danger is on the other side; that the Army will protect the Indians against the whites, for wherever I have been—and I have seen a good deal of these Indians—they have begged me to put an Army officer in charge of their interests. This was peculiarly the case with the Navajoes last summer.

The War Department can employ civilian agents for the peaceful tribes, and military agents for the warlike tribes.

Christian and civilizing influences can be as well used by the military as by the civil.

There will be less hypocrisy and cant with the military agents than with the civil.

The military will keep the peace, protect reservations against unlawful intrusions by the whites, and can allow and encourage different Christian denominations to compete in the matter of churches and schools.

The economy will be in using one set of machinery for both Army and Indians, instead of, as now, two.

In case of transfer, one head of department would have control of all the agencies, and of all the troops, so as to apply the remedy on the spot, instead of by the system of circumlocution now in practice.

Those are a few of the reasons which suggest themselves daily. It ought to be a question of national economy and efficiency, instead of one of mere patronage.

I have written this off, as you see, in some haste, because I have appointed to be in Baltimore to-day, and have no time to condense the substance into a shorter space; but if you want more data, or more facts than you have collected on the frontier, I assure you that the records of the War and Interior Departments contain cart-loads.

With great respect, yours truly,

W. T. SHERMAN, *General.*

Hon. ALVIN SAUNDERS,
United States Senator, and Chairman of Joint Committee on Indian Administration.

The CHAIRMAN. Without propounding to you any special questions, we would be glad to have you make a general statement of your views upon the conduct and management of the Indians.

General SHERMAN. Anticipating this to be the wish of your committee, I have prepared notes which will enable me to give my opinions in a connected series.

I beg to be construed as a witness duly summoned, and not as volunteering testimony or opinions, nor as a special advocate for the transfer of the Indian Bureau back to the War Department. I recognize the questions involved as national and economical, and pledge a hearty, cordial support by the Army to whatever plan this committee may advise and Congress adopt.

On Wednesday last, November 27, in answer to a note from your chairman, Senator Saunders, I wrote a letter, which has just been read, which I hereby affirm, and will endeavor to supplement the averments in that letter by a few illustrations. The management of the Indians from 1789 to 1849, a period of sixty years, was in the hands of

the War Department. Since that date, twenty-nine years, it has been in the hands of the Interior Department. Each department can now be tested by acts instead of professions. A comparison I will not venture to make, but with your consent will limit myself to some examples to show how awkward is the present system of management by civil agents who find themselves intrusted with the care and maintenance in peace of a restless, if not a savage, race of Indians.

Mr. Crosby, chief clerk of the War Department, has handed me an "Index of papers passing through the office of the Secretary of War, relating to the care, supply, protection, &c., of Indians, for the year 1877," showing about five hundred cases.

To illustrate, I will read a very few of those cases and pass the paper to the committee for inspection.

The first is War Department letter relative to the desire of the Apaches to return to Fort Stanton.

The second refers to an issue of blankets to Indians at Camp Harney.

The third is a modification of General Orders No. 8, 1869, Military Division of the Missouri.

The fourth: Captain Boyle is ordered to relieve Captain Bell as inspector of Indian supplies.

The fifth: report of the number of Indians at Standing Rock.

The sixth: complaint of Indians from Malheur Agency.

The seventh: Colonel Huston's report witnessing the delivery of annuity goods at Fort Berthold.

The eighth: report of the Quartermaster-General of the amount due the War Department for supplies and materials furnished Indians, &c., to the number of 500 separate cases in 1877.

The index for 1878 is not yet made, but I have brought from the office a few samples for the inspection of the committee, some of which were only received yesterday, and as these illustrate not only the mode and manner of transacting this most complicated business, but the great variety of subjects where the Indian Bureau calls on the War Department and Army to help it to execute its office, I ask for them special attention at this reading, as the papers must be returned for their files.

The first paper is an application from the Interior Department, dated August 12, 1878, and signed by the Hon. Carl Schurz, addressed to the Secretary of War, in which he transmits a communication from the Commissioner of Indian Affairs, containing a note from Agent Godfrey, of the Mescalero Apache Agency in New Mexico, "asking that the commanding officer at Fort Stanton may be instructed to station a force of fifteen or twenty cavalry at Qularosa for the purpose of arresting straggling Indians who leave the reservation, and putting a stop to the liquor traffic in that vicinity."

The letter of the agent is herewith inclosed, but is too voluminous to read. It sets forth the fact that the Indians under his control at the Qularosa Agency are constantly going to certain villages to buy whisky, and he asks that the commanding officer be required to send a detachment to stop his Indians from trading for whisky, and citizens from selling whisky to his Indians, which leads to disorders. His request was complied with, and a detachment of an officer and fifteen men was sent by Major Dudley from Fort Stanton, and I hold in my hand the correspondence, which is very voluminous, showing that the officer was embarrassed beyond measure in executing the will of the agent, because it brought him in direct conflict with the civil authorities of New Mexico. The people of the villages, of course, had an interest in selling whisky, whereby they made a profit, and they did everything they could

to embarrass the officer in his official duty, and it was doubtful whether he had a right outside of the reservation to enforce the request of the Interior Department. These papers will show one case of the roundabout process whereby the agent applies to Washington to his own chief, the Secretary of the Interior, who applies to the War Department; the Secretary of War sends orders to me, and I to General Sheridan; he to General Pope; he to General Hatch at Santa Fé, and he again to Major Dudley, the commander at Fort Stanton, in order to stop the sale of a little whisky at Qularosa.

The second case I have is a similar one. It is a communication of the Secretary of Interior, under date of October 4, 1878, acknowledging War Department communication of the 11th ultimo, inclosing copy of letter from General Sheridan, dated September 6, 1878, reporting disposition to be made of five Nez Percé men and four squaws held as prisoners at Fort Shaw, Montana. These Indians had been with Joseph at the time of his fight near the Little Rockies last year, who escaped into British territory, came back, and while they were near the Blackfeet Agency, upon Marias River, were captured by a detachment of soldiers and taken to Fort Shaw. They have since been taken to the Indian Territory and added to the band of Chief Joseph and his Nez Percés, already established there. All this work was done by the Army, the Indian agent simply being the medium of communication.

The third paper to which I wish to call attention is dated November 1, 1878, a similar application from the Interior Department to the War Department for assistance to enable Agent Bird, at Fort Peck, high up on the Missouri River, to arrest certain half-breed Canadian Indians, who had come from Canada to trade with the Indians of the Fort Peck Agency and kill buffalo, and who were interfering with the police on that reservation. The Indian agent in this instance, in due time and in the usual course, made application for assistance, which had to go to Washington, go back by the same roundabout way to the commanding officer at Fort Benton or Fort Buford, whence a detachment went and found that the half-breeds had been there and gone back to Canada.

Here is a similar application, dated November 1, 1878, from the Interior Department to the Secretary of War, conveying a telegraph dispatch from Indian Agent King, at Brainerd, Minn., reporting that certain of his Indians had broken into his storehouse and taken by violence and force goods therefrom; asking the department to procure assistance from the War Department to cause the arrest and punishment of the Indians who had perpetrated this act of violence. These papers were, in due course of business, sent from me to General Sheridan, then to General Gibbon, and by him to General Sturgis, who happened to be traveling on the railroad this side of Fort Lincoln, who went to Brainerd, and made a full report, which report is here.

The fifth paper is a similar one, of November 13, 1878, from the Interior Department, acknowledging the letter from the War Department of the 19th instant upon the subject, and requesting that the military authorities in charge of the proceeds of sale of arms and ponies taken from the Nez Percés, as before related, may be instructed to make the purchase and distribution of the cattle; that is, to sell the ponies and other plunder, and invest the proceeds in cattle, to be distributed to them at their new agency. That has been done by the military.

The sixth paper, to which I wish to invite special attention is dated November 15, 1878, from the Secretary of the Interior, and signed with his name, addressed to the Secretary of War. I make this case special

because yesterday Secretary Schurz questioned the existence of such a paper in this room here, simply because his memory did not retain it:

DEPARTMENT OF THE INTERIOR,
Washington, November 15, 1878.

SIR: I have the honor to transmit herewith a copy of a letter dated the 8th instant, inclosing a copy of a communication from United States Indian Agent P. B. Hunt, in charge of the Kiowa, Comanche, and Wichita Agency, Indian Territory, in relation to the insubordination of Big Bow, a Kiowa chief, whose conduct is the source of much alarm and trouble, with the suggestion of General Davidson, as noted therein.

The subject is respectfully presented for the consideration of the honorable the Secretary of War, and such action as may be deemed advisable in the premises.

Very respectfully, &c.,

C. SCHURZ,
Secretary.

The Hon. SECRETARY OF WAR.

That communication contained the usual letter from the Commissioner of Indian Affairs, an original paper signed by E. A. Hayt, now in my hands, and the letter of Agent Hunt, which is of sufficient interest, I think, to warrant me in reading it in full:

KIOWA, COMANCHE, AND WICHITA AGENCY,
Fort Sill, I. T., October 31, 1878.

SIR: I have the honor to state that since I have been here I have been troubled a great deal with "Big Bow" (Kiowa chief), and have never felt that my life was safe in his presence. About a month ago he collected nearly all the ration tickets of the Kiowas with the view of turning them over to me and demanding that the rations be issued to him in bulk, but before he did so his people rebelled, and he was glad to have assistance in distributing them to the rightful owners. For this interference of his I have since refused to recognize him, and have given the beef-order to another Indian, and placed him in charge of the band. Big Bow has not shown himself since until last night, when he came to my office, and, while in the presence of a number of other Indians, he asked if I intended to recognize him, and do business with him, to which I replied I did not; that I could not call upon a man to do anything who acted badly; that if he was going to do right, that then I might change my mind. He then attempted to draw his revolver, but Mr. Clark, the interpreter, caught his arms, and I caused him to sit down. Mr. Farmer, my storekeeper, was a witness to the same thing. If he had not been stopped, he probably would have shot me. He slept in the council-room last night, and is this morning around the agency. He asked Mr. Clark, the interpreter, this morning why he got alarmed last night when he attempted to get his revolver, saying that he did not want to kill him (Clark). It cannot be proven in court that he had a pistol, as it was not seen, but he admitted to Mr. Clark that he had one. It is his custom to wear one, and it is not presumable that he was without one at this time. He came to the office with war paint on, and when I spoke to him he would not recognize me. I would have asked for his arrest at once, after this violent demonstration, but I feared the result of an acquittal in a civil court, believing, if acquitted, he would be still more dangerous than ever. I have had a talk with General Davidson this morning, and he suggests that if you will direct that he be turned over to the military, with the recommendation to the Adjutant-General of the Army that he be confined two or three years at Fort Leavenworth, Kansas, or elsewhere, that it will be done. I earnestly urge your favorable action in this matter, for I cannot make my trips between my two agencies with any degree of safety, so long as he is at large, without a military escort. It will be remembered that Big Bow was one of the leading hostiles of 1874, who secured his liberty by a piece of strategy. He is a notorious bad man, and ought to be confined. His course is not approved, nor has he the sympathy of a majority of his tribe, and I am satisfied his confinement would have a salutary effect.

I will thank you to let me hear about this case as early as you can.

Very respectfully,

P. B. HUNT,
United States Indian Agent.

Hon. E. A. HAYT,
Commissioner Indian Affairs, Washington, D. C.

I sent it back to the Secretary of War asking specific instructions, and he returned it with an indorsement denying the legality of the imprisonment for three years of this Indian at Fort Leavenworth prison, be-

cause under the law of Congress it requires a condemnation according to due process of law before a commitment can be made. He informed the Interior Department that it was impossible to comply with the request. I have gone into this paper a little at length because yesterday I told Secretary Schurz that this case had come to me since his controversy with General Sheridan about the Fort Sill Agency, showing the existence of vicious Indians there whom his agent could not manage without the help of the Army, and this letter confesses the fact. I have no doubt the subject had passed out of his memory at the time.

These are only six cases, modern and recent instances, picked out of the vast mass, of which, as previously stated, there were 500 in 1877, and will doubtless be at least the same number this year, which demonstrate that each day may occur some accident which the Indian Bureau of itself cannot manage without the physical help of the Army.

After leaving your committee-room yesterday and going to my office I found, in the usual daily routine, five additional cases, which are also offered by way of illustration:

7. October 31, 1878.—Secretary of Interior reports release of Jack Martin, an employé of the agency, for selling ginger to George Ront, half-breed interpreter, at the Cheyenne Agency, Fort Reno.

This is of very little interest except as showing the controversy between the commanding officer, Major Mizner, and the agent as to what constitutes a breach of the law of Congress (the intercourse act), Major Mizner contending that the selling of medicines, such as ginger, was not a violation of the law. The Indian agent claimed that much of the ginger and other trash sent out as medicine was in fact whisky or adulterated liquors for the purpose of making his Indians drunk.

The next case is of date 26th November, 1878, originating with General Pope reporting that an Indian by the name of Little Robe, with his people (Southern Cheyennes), about one hundred and thirty, including women and children, had left their reservation by permission of the agent at Fort Reno, for the purpose of hunting in the direction of New Mexico, which caused uneasiness on the part of the white people living in that quarter, although these Indians were not regarded as hostile. The controversy has existed for a long time between the Army and the Interior Department as to the right of an Indian agent to give passes which enable Indians to go and hunt beyond the limits of their reservation, for the old rule was and should be, that when Indians pass beyond their reservation they become subject to the laws of the country into which they pass, which is "military law" in that region—namely, the Upper Arkansas. I doubt myself whether an Indian agent has any right to give his Indians permission to go beyond the limits of his reservation to hunt, especially when there is an apprehension of danger, as was the case last summer by reason of the flight of a portion of those same Indians—the Arapahoes and Cheyennes—who in their flight committed many terrible murders in Kansas.

The next paper which I brought is one dated November 27, 1878, from General Sheridan, inclosing communication from Major Brisbin, at Fort Ellis, Montana, saying that in pursuance of instructions which came from Washington he had seized the agency of the Crows on the Yellowstone, had deposed Agent Frost, and established Captain Browning in charge of the agency, to await the action of the Interior Department. That seizure was based on a request of the Secretary of the Interior himself.

The next paper which I wish to offer is dated November 22, 1878, from the Interior Department, in reply to letter from the War Department of

11th instant, inclosing copy of telegram from General Sheridan, concurring in recommendation of Commissioner of Indian Affairs that the Cheyenne prisoners at Camp Robinson, who were engaged in hostilities, be taken to Fort Wallace, or other military post in Kansas, with a view to the identification of such as committed outrages in said State, and their delivery to civil authorities for trial, and that the remainder be returned to their agency in the Indian Territory. This simple communication involves a great deal of labor, every particle of which must be performed by soldiers, and not one particle of it can be done by the Indian agent in his civil capacity.

The last paper which I wish to submit to this committee is one which has been the subject of a great deal of correspondence in the newspapers, containing the history of the recent removal of the Kiowa and Comanche Agency from Fort Sill to the Wichita Agency, north of the Washita River, by an executive order. Much of this correspondence has been published, and I have no doubt is already familiar to your committee, made so by the press, and therefore I will only remark that the last of the series is a letter dated November 29, 1878, from the Department of the Interior, Secretary's Office, signed by the Hon. Carl Schurz, Secretary, indorsed "Reply to the War Department letter 23d instant, transmitting the indorsements of Generals Sherman and Sheridan, and that General Sheridan be requested to give specifications to his general charges contained in the indorsement that the appropriations were not properly applied."

This communication will, in due course of official usage, be sent to General Sheridan, as he is more directly concerned than I am, and he is abundantly able to answer it fully and perfectly.

But as the case is one illustrating the impossibility of reconciling the natural and necessary conflict in this double-headed machine of Indian management, I will state here a few facts not of record. Secretary Schurz in this last communication admits what was first alleged as the cause of removal, that as to soil and water, Fort Sill is a good reservation, but argues that the water is only good *above* but not *below* Fort Sill, being defiled by the camp drainage. I have been to Fort Sill twice, in 1871 and 1876, on both which occasions *all* the Indians were encamped *above* the fort, and such has always been the case, as I am informed. The agency buildings and school-house are a few hundred yards below, but the Indians were never there, except to draw their rations, which they carried to the camps above.

Fort Sill is near the center of the Kiowa and Comanche Reservation, which is about 60 miles square, or 3,600 square miles; enough for 14,400 families, each family with a quarter-section, or allowing five to a family, enough land for 72,000 souls; whereas the Kiowas and Comanches number 2,939, and therefore they actually possess more than four sections of good land to each family. Measuring their wealth by any standard, they are the richest agricultural or pastoral people in the world. By consolidating them with the Wichitas their agency will be outside of their own reservation, and will be among the Wichitas, who don't want them.

Among others the honorable Secretary quotes Agent Paterson as recommending the removal of the Kiowas from Fort Sill, because of the damaging influence of the soldiers. Now, when I was at Fort Sill, May 27, 1871, Mr. Paterson was the agent, and an excellent good man he was; but he came to me and personally confessed his utter inability to control his Indians; this in the presence of many officers, among whom were General Marcy and Colonel Tourtellotte, both now present here in Wash-

ington. He said his Indians had been down in Texas and had come to the agency to draw their rations with the blood of murdered white men still on their hands, actually boasting of their deeds. He asked me to take those Indians in hand, which I did, and confess that I am amazed that Mr. Paterson should be quoted against me, and as advising the removal of these very Indians to a place where soldiers are not to be within call, to assist in protecting the agency and in restraining the wicked.

Since the Secretary of the Interior now does not want the company of cavalry first asked for, and disclaims any desire to break up Fort Sill to follow the agency, I am willing and will advise the withdrawal of the garrison now at Fort Sill to some other quarter where it is much needed.

I believe the constant removal of Indian agencies, which has cost to the Army appropriations so much money, results, in a great measure, from the weakness of agents, who yield to the insatiable desire of the Indians for change. Ever restless, they seem doomed; for instead of settling down where they are put, they yearn for a new change, while the circling chain of the white man's settlements is being drawn around them closer and closer, and soon the poor Indian will hardly have room for graves. Those who profess so much love for this race of men, by thus yielding to their wild nature, will prove their worst enemies, for each move is always for the worse, and unless they acquire title to land and hold fast to it, the surveyor's compass and chain, controlled by the Secretary of the Interior, will mark out the land, and give a title to the white squatter who knows and appreciates its value.

In this connection, I trust your committee will pardon me for reminding them that in the next thirty years, by the established rate of increase, 33 per cent. every ten years, the white population of the United States will be about 80,000,000 of people, that all the agricultural land will become a necessity, and that the pressure upon these Indian reservations will require more force than a peace agent possesses to exclude from their surplus land the honest white farmers and ranchmen.

The power to protect as well as to restrain the Indian should be on the spot. It is cumbrous, unbusiness-like, and weak to work so vast a machine from Washington by the process now in vogue. If an Indian agent's life is threatened by a half-tame savage, he must write to the Commissioner of Indian Affairs in Washington, he to the Secretary of the Interior, he to the Secretary of War, he to the commanding general, he to the division commander, he to the department commander, and finally the nearest post commander gets back his legitimate orders to act, which he should possess in the first instance.

Any merchant or business man who would conduct his affairs on such a plan would fail in a week. Were we to conduct war on this plan, failure would result as a matter of course. The Indian affairs of our country are so intermingled with the Army that both should have but one head, and large power should be delegated to agents on the spot. The Army should be transferred to the Interior Department, or Indian affairs should be recommitted to the War Department. I think there is no escape from this logic.

General Schurz, in his letter before referred to, of November 29, 1878, states the same proposition in other language equally true--that the present conflict between the two systems is such that he and General Sheridan look at the same facts from opposite directions; both are equally honest, yet both cannot be right. General Schurz believes that his removal of the Kiowas to the Wichita Agency is wise and humane,

and *now* he don't want soldiers to protect his agency ; but General Sheridan knows that within a year the agent will cry aloud for help; that General Schurz will ask it of the Secretary of War, and that he will order it. So this double-headed machinery has worked for the past thirty years, and all the while the Treasury is doubly taxed, and the poor Indian goes to the wall.

I have here a map of the reservation, of the country about Fort Sill, showing the Indian reservations in the neighborhood, which I will leave with your committee. It will assist to illustrate the force of my argument.

I also beg leave to submit pages 11, 12, 13, and part of 14, on the subject of the issues of commissary's stores during the past fiscal year to various tribes and parts of tribes of Indians, by the commissary agents of the Army. It is an official document, entitled "Report of the Commissary General of the Army to the Secretary of War, for the year ending June 30, 1878."

In discussing this Indian question I have often been met with the assertion that President Grant, a military man, with much experience in Indian management, was the author of the so-called "peace policy." That policy, if honestly meant to keep the Indians at peace, is wrongly named, for we have had constant war with Indians since 1869. The previous year Congress had reduced the Army by twenty regiments, throwing out of active service about six hundred experienced officers. One of General Grant's first acts as President was, from these officers retained in service on the unattached list, to select all the superintendents and agents for the Indians. My understanding at the time was that this was construed as taking the civil patronage from Senators and others who wanted it, for at the next session of Congress was enacted a law which made the acceptance of such an office by an Army officer equivalent to a resignation. The consequence was that all these officers had to be replaced by civilians, when General Grant concluded that he would not confer this patronage on the parties who had accomplished this legislation, but would distribute it among the churches, whose ministers could defend their privilege from the pulpit. This was known as the "Quaker policy," because some five or more of the agencies (that of Fort Sill among the number) fell to the share of the Quakers. The remaining agencies were divided up among the Methodists, Episcopalians, Catholics, &c., and so remain to this day. This is all there was or is in the "peace policy." This may be good politics, but surely is bad statesmanship. The true policy is to locate each tribe as well as possible, and, by force and persuasion combined, compel them in time to make a living by some sort of labor, because the time is already past when Indians can live by hunting.

By the CHAIRMAN :

Q. What proportion of the Indians do you think are what we call warlike or blanket Indians?—A. I have before me a very convenient table, a part of the public documents which were sent to Congress yesterday from the Indian Office. It is a little too long to read, and I will leave this document with the commission, and will refer you to pages 10, 11, and 12 of the "Tabular statement of disbursements made from the appropriations for the Indian Department for the fiscal year ending June 30, 1878, and of the salaries and incidental expenses paid at each agency in the Indian service during said period, showing the appropriations from which paid, and *the number of Indians at each agency.*" Looking over this list, I will note such as occur to me that ought to be governed by

military force. San Carlos, Arizona, 4,502; Southern Ute, Colorado, 786; White River, Colorado, 800; Cheyenne River, Dakota, 2,025; Devil's Lake, Dakota, 1,075; Fort Berthold, Dakota, 1,292; Lower Brulé, Dakota, 1,269; Red Cloud, Dakota, 6,709; Spotted Tail, Dakota, 6,861; Standing Rock, Dakota, 2,444; Yankton, Dakota, 2,112; Lemhi, Idaho, 950; Cheyenne and Arapahoe, Indian Territory, 5,054; Kiowa and Comanche, Indian Territory, 2,939; Leech Lake, Minnesota, 2,279; White Earth, Minnesota, 2,872; Blackfeet, Montana, 7,600; Crow, Montana, 2,500; Mescalero Apache, New Mexico, 1,400; Navajoe, New Mexico, 11,850; Malheur, Oregon, 897; Umatilla, Oregon, 1,023; Colville, Washington Territory, 3,457; Yakama, Washington Territory, 3,770; Shoshone and Bannock, Wyoming, 2,185.

Q. Do you consider the Yakamas as wild?—A. No, they are not; but I think that, in spite of all that we can do, Moses's Spokanes will become hostile in that quarter, and there ought to be the protection of a garrison in case of complications or conflicts with this band, which numbers three thousand, now living all along up the Columbia River, as far as the Spokane Bridge. Therefore, I would advise, although we might retain a civil agent at Yakama Agency, that we should have a garrison thereabouts to protect them.

Q. You leave a large number on the other list?—A. The whole list embraces 221,789 Indians, and, after deducting what I have given from that number, the greater part of the smaller agencies might be given to civilians, with the general supervision to the Army, with power of visitation, to oversee the issuing of rations and accounts, police, &c.

Q. That was the very question I wish to ask—whether you would consider it necessary for those who are in a state of civilization should come under the control of the military, or whether they might not be managed otherwise?—A. I would use the civil agents, but always retain the power of inspection, so as to insure that regularity of supplies and goodness of police which characterize the military.

By Mr. SCALES:

Q. To whom would the civil agent be responsible?—A. To the War Department, which would give him full discretion. Agents, civil or military, ought to have large discretion.

By Mr. STEWART:

Q. You include the White Earth Indians in those you named? Those Indians are cultivating the soil and dress as we dress.—A. I ran down the list very hastily; I think I was in that instance governed by the number.

Q. The Chippewas have never given us any trouble?—A. Wherever Indians are peaceable I would not bother them.

By the CHAIRMAN:

Q. One other question. I see that you would be favorable to allowing the military at the post to conduct affairs there, to punish, &c.; do I understand you that you would yield the power at the headquarters here and allow the war to be run there?—A. No, no; the power would be retained here as a matter of law, but according to usage we would try to have such persons at the different agencies as we could fully trust, and would not have to watch as you would spoiled children. I can trust the commanding officer in Arizona, for instance, and give him the whole power I have. It is General Wilcox. He is a gentleman with such experience that I would trust him with any power that I myself possessed,

at the same time making him responsible to the law for all his acts, reporting promptly for confirmation in all doubtful cases.

By Mr. HOOKER:

Q. I was not here during your entire statement, and I wish to ask in reference to this Cheyenne outbreak which took place this year. Have you embraced that in your written statement?—A. I have not.

Q. State to the committee, if you please, how it originated, and what the cause of it was, so far as you know.—A. I have no personal knowledge of it. My opinion is derived from reading the letters and accounts of the officers thereabouts, and the reports of such as were sent in pursuit. They are all on file, have been collated by their immediate commanders, and will be submitted in print, and I would prefer to refer you to them. My impression is that certain of the Northern Cheyennes, who were sent some two years ago from the Sioux country above the Pacific Railroad to the agency of their relatives south of the Canadian River, have been restless and uneasy ever since, as all Indians usually are, and that they complained of everything. Finally they started to go back to the land from whence they came, and those who are familiar with the Western prairies know how easy it is, by winding about by night, to escape. They escaped for a time and reached the sand hills near the source of the Niobrara, where they were finally captured by the troops, and some of the papers I have read here to-day show that they are now being taken to some point in Kansas for the State authorities to select out the murderers, and the remainder will go back to the point from whence they escaped. The murders committed by these Cheyennes occurred at their old camping ground on the source of the Republican, occupied by illiterate Mennonites, who probably never saw an Indian until they felt his tomahawk. There were about forty of them killed. The ringleaders will be taken to Kansas for the State authorities to identify, and such as have been already or may be indicted will be surrendered to the civil authorities to be tried, just as though they were white men; the remaining part will be taken back to the agency whence they came, Fort Reno, as a punishment for their attempt to escape. I would not like myself to sit in judgment here upon the diverse statements of agents and military officers upon that point. They differ very widely, illustrating Secretary Schurz's remark that the military and civilians seem to look at the same state of facts from opposite directions. One sees the front and the other the back. Both cannot be correct. In their respective statements there is a wide discrepancy. The military say that these Indians for a long time have been complaining of not having enough to eat and of being starved, and that they would rather go out and be killed like warriors than be starved to death on the reservation. The agent asserts that they had as good and as much provisions as their fellows who did not run away but remained, and the Commissioner here proves that the agent had these provisions, and that the supplies were sent forward in good season and were properly issued. Between these two statements I do not think I ought to sit in judgment. I would prefer not to do so.

By Mr. HOOKER:

Q. The committee, or a portion of it, had occasion to visit the more recently subdued Nez Percés and Modocs. We found very great mortality among them, and I want to ask you the general question as to whether or not in your judgment, from your experience and personal observation as well as from reports of officers, it should be the policy of

the government to have a northern reservation set apart for the purpose of locating the Indians who are acclimated to that country, and a southern reservation for those who are accustomed to that climate?—A. Such reservations were selected by a commission of which I was a member in 1868. The great Sioux reservation lies north of the State of Nebraska, and any part of it is available to the Indian Bureau for the location, as I understand, of any tribe of Indians, or any fragmentary tribe they choose to put there. In like manner there is a reservation, known as the Indian Territory south of the State of Kansas, available for other fragments, and the general policy of that commission was to divide the Indians of our Western Territories by a zone or belt across the continent, bounded on its northern and southern boundaries by the States of Kansas and Nebraska and extending to the Pacific Ocean, and thus to throw one moiety to the north and one to the south. Having adopted that general feature, we endeavored in all details to carry it out, but in 1870 the whole thing was knocked into "pi" by this modern peace policy, of which you know as much as I do. The Interior Department can, as I understand, send their prisoners or fragments of tribes either to the Indian Territory south of Kansas, or to that of the Sioux north of Nebraska. They ought to be governed by the ordinary rules of humanity. They ought not to send extreme northern Indians to the southern territory, or *vica versa*, although in the end the present Modoc and Nez Percés location is a better country for Indians than any part of the Sioux Reservation north of Nebraska, according to my opinion.

By the CHAIRMAN:

Q. You allude to the soil and country, not the climate?—A. I refer to the soil and its adaptability to Indian cultivation, for the Modocs and Nez Percés were accustomed to work land in their own country, in Oregon and Idaho, before their outbreak. These particular Indians, being malefactors, have no choice.

INDIAN POLICE.

By Mr. SCALES:

Q. In regard to this question I see discussed in the newspapers and recommended by the Secretary of the Interior as to organizing an Indian police with a view to controlling the Indians?—A. That has been a subject of discussion for a long time. We have always enlisted Indians when they wanted to as soldiers under the same laws as white men. In 1866 Congress provided for a thousand Indians to be organized in the form of scouts. We had a battalion of four companies of Pawnees, under Major North, in the service in 1873. Creeks and Cherokees were used in the Florida wars, and we have used Indians in all our wars; but under the law cited for a thousand scouts we usually kept about six or seven hundred, and distributed them in various directions, and they were very useful, for they have all the Indian sagacity of trailing and judging by signs on the ground. But little by little the Army has been reduced, until now these Indian scouts are charged as part of the twenty five thousand aggregate; therefore we cannot afford, without breaking up our white regiments, to employ more than 300; 300 to-day are thus employed. The Indian Bureau now proposes to organize the young bucks as soldiers, subject to the orders of the commanding officer in the neighborhood. I think you will find Western people, especially those in Wyoming, Montana, Dakota, and even Nebraska, will object to putting modern arms and ammunition in the hands of

Red Cloud and Spotted Tail Sioux. If I was to settle within 500 miles of them, I should object to it strongly. It is arming a dangerous enemy. If the Indian Department cannot control them with neither arms nor ponies, I do not know how they can undertake to control them when they have arms and know how to use them. Some of the Indians might be enlisted and incorporated with the present Army. We do not object to it, but are willing and have always been willing to have it done, and to-day we have Indians enlisted in our ranks, governed by the same laws and the same regulations as to pensions and bounty as white men. I think that is the true rule, to put the Indians on a par and not above the white man.

By Mr. BOONE:

Q. I would like to make this inquiry: Suppose these forces were organized, would that do away with the necessity of transferring the Indian Bureau to the War Department?—A. Not at all; because I understand the Indian Bureau proposes to make these soldiers subject to the War Department at once. Then comes the question, suppose you organize a regiment of soldiers out of Red Cloud's Indian warriors, and you suddenly want this regiment down in the Indian Territory about Fort Sill, and you order them down there with arms in their hands. The probability is they would not obey orders; they would disband and scatter; they would not go out of their own territory; and it is always bad to organize local troops where they will likely mutiny if you undertake to remove them from where they understand they have to serve.

Maj. Gen. M. C. MEIGS sworn and examined.

Mr. MCCREERY. We are directing our inquiries in regard to the propriety of transferring the Indian Bureau to the War Department, and we would be glad to have your views.

The WITNESS. I have never been stationed in the Indian country, and have had very little experience with the Indians, and consequently have very little knowledge of this subject, so that I do not think that I am in a position to give any opinion to this committee. I came here on a summons, and am ready to answer questions on any particular point. I do not feel competent to give any views which I have gathered simply from the general discussion of this subject in the public press.

TRANSFER SHOULD BE MADE.

By Mr. MCCREERY:

Question. What is your opinion as to the propriety of the transfer?—Answer. I think the transfer would be well for the Indians but ill for the Army.

Q. Can you assign any reason for that opinion?—A. The Indian would be treated with humanity, with firmness, and with justice. The orders of the Executive and of Congress would be strictly carried out; the supplies voted by Congress would be delivered to them of good quality, and absolutely in the quantity which was intended, but they will not be sufficient to feed 250,000 Indians.

COST OF FEEDING THE INDIANS.

By Mr. STEWART:

Q. You say the supplies would not be sufficient to feed 250,000 Indians?—A. They will not be sufficient to feed 250,000 Indians. The last appropriation for Indian affairs amounted to about four and a half millions.

The cost of feeding 25,000 men in the Army is about two and a half millions a year. It is simply a question of arithmetic to see what it will cost to feed 250,000 Indians. It will be about twenty millions a year. I do not think that problem has ever been presented to Congress. I have never seen it alluded to in the public press.

INDIANS MUST BE MADE SELF-SUSTAINING.

In order to make it possible to feed Indians in such great numbers, it is necessary to make them in a great degree self-sustaining. The only way, I think, to do that is to make them herders. I have no faith in their becoming agriculturists, except to a small degree, and after a good many years' apprenticeship. I do not think they can be brought to this except by force. The Indian has learned since the white man came to this continent to be a herder of horses, but not a herder of cattle, because there has been no necessity for it. Buffalo were to be found everywhere in his range, and they supplied him with what to us was given by the domestic cow and ox. The buffalo have almost disappeared, and I think it is possible to teach the Indian to herd cattle and sheep as he now herds the pony. The greater part of the country in which the Indian lives is entirely unfit for agriculture. The winters are too cold and the summers are too dry; it is only here and there, by means of irrigation, that even the white man can raise crops. I think the first step, therefore, in bringing him from a barbarous to a civilized state is to change him from being a hunter to becoming a workman—to be a herder or shepherd.

By Mr. BOONE:

Q. In making your estimate of the twenty millions of dollars to feed the Indians, you calculated that they are to be fed exclusively by appropriations from Congress; you did not make any estimate of products of their own?—A. By bringing them to a pastoral state you will be able to make them contribute something gradually to their support, but generally, according to newspapers and public discussion, it is cheaper to feed an Indian than to fight him. His appetite is as good as a soldier's, and if it cost 24 cents for a white man's rations to be carried to him and delivered to him, I say it will cost 24 cents to pay for it for the Indians.

Q. Whatever might be necessary for that purpose, upon the idea of appropriations as now made, I would like to have you state to the committee whether or not, owing to your system of purchasing and disbursing, supplies can be more cheaply furnished to the Indians than under the present system as practiced by the Interior Department?—A. I do not know enough of the Interior Department system in detail to answer that question. I can only say that we buy our supplies by contract from the lowest bidder, and very little is lost in transit, and I think none stolen.

RATES OF TRANSPORTATION UNDER THE INTERIOR DEPARTMENT CHEAPER THAN UNDER THE WAR DEPARTMENT.

Q. Your system of transportation is nearly perfect?—A. Our system is perfect, and yet I was a little surprised in preparing an answer to some inquiries of this committee to find in some cases that the Indian Department has made contracts for transportation at considerably lower rates than we have, upon very nearly the same lines. I can only account for it by the fact that they shipped it at certain times in large quantities, and, under keen competition, somebody took the contract at a low rate. I can never judge of what a contractor can do. When they

offer to contract at half what the contract is worth, I do not say that he cannot do it. I have been engaged many years in buying and selling, &c., and I have found that a contractor knows better than I do what he can do. If he appears to be an upright man I nearly always give him the contract. I think some of their Missouri River contracts were considerably lower than ours, although ours were made by public advertisement, in the course of the same season. The Indian Department got lower prices than we did.

Q. What is the general rule, as far as you have observed—are these exceptions or are they the rule?—A. I think these are the exceptions. That is the only case in which I looked at the Interior Department's rates.

By Mr. STEWART:

Q. On this subject I would like to ask the General some questions. Inasmuch as we have taken a good deal of testimony on this point, and it has been claimed that the advantages of the War Department over the Interior Department in matters of transporting supplies are superior, I would like to ask the General if he can give me the rates of transportation from the seaboard to the various posts—Fort Reno, Fort Sill, &c.—A. You already have that in a written communication from my office in answer to certain questions of this committee. It is shown in that communication that in some cases the Interior Department had secured rates lower than ours.

Q. How is your freight classified—by the railroad classification?—A. Yes, sir; we follow the commercial classification.

Q. What are the rates of transportation on the Missouri River?—A. I do not carry them in my mind. I could answer you if I were in my office by referring to the contracts.

Q. Have you any idea of the aggregate number of miles of your whole transportation?—A. We have thousands of different routes; almost every contract has a different route.

Q. I would like to ask you if there is ever charged under the various heads of transportation anything that is not properly applicable thereto; for example, mules, harness, and wagons?—A. Our transportation and supplies are furnished by contract. The mules, harness, and wagons are for local transportation, to follow troops and scouting-parties.

Q. There is nothing charged under these heads but what is properly applicable thereto?—A. Just what we pay the contractor, what we give him; the rate we give, and the rate we pay the contractor. We spend about four millions a year for transportation—for transporting supplies and troops, and in buying mules, harness, and wagons; in getting the troops in a condition to march.

Q. My question was as to whether or not other items of expense were ever charged to those different heads to cover any other expenses?—A. No, sir; the rate of transportation is what we pay the contractor for it. We do not charge any clerk hire.

Q. I am not speaking of that particularly; I mean any items of expense in your department—whether they are ever charged under these different heads, as for the purchase of mules, wagons, &c., which do not properly belong to those heads?—A. Not to my knowledge, and I think there can be no case of the kind; if I should find out such a thing I would have the officer cashiered.

By Mr. HOOKER:

Q. I understand you to express the opinion that owing to the exact system of the commissariat and the Quartermaster's Department of the

Army that whatever appropriation should be made by Congress would be certain, adopting this system, to reach the Indians for whom intended. Have you known any instance of default on the part of civil agents in getting the proper supplies to the Indians?—A. I know nothing more than we see in the newspapers.

Q. Have you ever known of the successful prosecution in the civil courts of the country of a defaulting Indian agent?—A. It is stated to me that some contractor of the Interior Department has lately been found guilty.

Q. Very recently?—A. Yes, sir.

Q. Do you know of any other?—A. That is the only one I remember to have heard of.

Q. In speaking of the number of Indians, do you include in the estimate which you made of the aggregate number of 250,000, the semi-civilized as well as tribal Indians?—A. I just take from what I find in the Indian Bureau reports as about the number of Indians. They number about 250,000.

Q. That embraces all?—A. Yes, sir.

Q. Is it not true, and are you not aware of the fact, that a very considerable portion of the Indians both in the Indian Territory and at other points, where they are to some extent civilized, have become to some extent agriculturists, and are raising cattle? Is it not true that they sustain themselves?—A. They must sustain themselves or else they would have been starved long ago. Four and one-half millions will not feed so many.

Q. Is it not true in reference to the five semi-civilized tribes—the Creeks, Choctaws, Chickasaws, Seminoles, and Cherokees—that they are self-sustaining?—A. I do not know. I have never been among them.

Q. Are you not aware, also, of the fact, when you speak of the inadequacy of the appropriation, that a very considerable portion of these Indians are paid by the government, on the trust funds which the government holds for them, their regular per capita in money, or by other methods which the Indian agent chooses to adopt?—A. I find the whole appropriation, which I understand to include all those payments, to be about four and a half millions.

Q. Your comparison of the amount which was necessary to support the Army, aggregating 25,000, is predicated upon the idea that in the Army the soldiers have no other means of support except from what the government gives them? That is not the case with regard to the Indians—a portion of them is self-sustaining?—A. I only used that for illustration. If you feed all of them, it will cost so much. By making them a pastoral people you will gradually make them self-supporting. Up to late years they were self-supporting from the buffalo, and the Indians of Oregon and the Pacific coast have always to some extent been agriculturists.

Q. The support by means of the buffalo is now gone?—A. Yes, sir; and they have got to substitute the cow and the sheep.

General W. T. SHERMAN recalled.

By Mr. BOONE:

Question. You spoke of the frequent troubles with the Indians during the last few years, and the number of wars we have had with them; I would like to have your opinion as to what would be the result in that respect in case of this transfer; whether or not under the management

of the War Department they would be able so to conduct affairs as to avoid most of these wars?—Answer. My judgment is that we could in most instances foresee the cause of war and nip it in the bud, and therefore Indian wars would be very rare, if not at an end, on anything like large scale.

Q. Owing to the circuitous route that a communication has to take from an Indian agent to the Interior Department here, then to the War Department, then to the Commanding General, &c., of which you spoke, if a reasonable authority were given to an officer in command in case of an outbreak, he would be able to comprehend it and check it?—A. The country is divided into nine military departments; every military department is commanded by a brigadier-general of experience and rank, to whom the law commits absolute power to do whatever I might do if present. The probabilities are that any Indian outbreak would be limited to a department. The nearest post commander, seeing trouble brewing in an Indian tribe, would first be held directly responsible for the outbreak, and would undertake to check it. If unable to do so by the force at his command, he would call upon his department commander, who would be bound by honor and usage to use every soldier in his command, and he generally would have enough men at hand to subdue any particular tribe, to check disorder, and suppress outbreak. If he wanted assistance, he would call upon the division commander, who would be bound to extend him every assistance by sending troops from other departments to this one. So the machinery is perfect, beginning with the officer on the spot.

By Mr. STEWART:

Q. Why could not that be applied to the present system, if an Army officer was informed of the approaching outbreak?—A. Because the Army officers have no right to meddle with Indian affairs until they are called upon by the Indian agent, and the agent is extremely jealous of local interference, and tries, as a matter of course, to avoid the necessity of calling upon troops until the last moment, and generally does not until *after* the last moment, until after the war has actually begun. Then this roundabout process is necessary, after which we have to guess at the extent of the disorder, and also guess at the necessary means for suppressing it, and generally go to work bunglingly before finding out the whole truth. Such was the case with the Custer war, as you remember, and such was the case this summer with the Arapahoes and Cheyennes, and also with the Shoshones and Bannocks.

By Mr. HOOKER:

Q. You read from a document containing an estimate of the number of the various tribes of Indians; are you aware how the census is taken?—A. I quoted from the document whose title I gave. It comes from the Interior Department, and I have no doubt that each agent has made his return as to the number of Indians at his agency to be fed and provided for to the Commissioner of Indian Affairs. I have no doubt this document is a very full and accurate census of the Indians subject to the jurisdiction of the Indian Bureau as at present constituted.

Q. Have you any knowledge, or do you remember the fact, that some years ago a Lieutenant Foote was assigned to duty as Indian agent of the Sioux? He preceded Lieutenant Reed, who was subsequently assigned to the same post under General Crook. Are you aware of the fact as to what he found to be the number of the Sioux for whom the Inte-

rior Department was at that time furnishing rations, and what was found to be actually the number?—A. I recall some report of a wide discrepancy, but at this moment I would not like to venture a guess as to what the discrepancy was.

Q. When was that?—A. It must have been about 1874. I do not remember, but these papers pass through my hands, and generally I get a pretty good idea of the substance of them. [NOTE: I have sent to Mr. Hooker the reports asked for, dated in 1876.—W. T. S.]

Q. I want to learn what the *modus operandi* of the Interior Department is in regard to taking the census. Have they any other means of ascertaining the number than by an estimate furnished by the Indian agent?—A. I do not know. I take the figures from this document, which, being approved by the Commissioner of Indian Affairs and the Secretary of the Interior, is usually accepted as final and conclusive of the aggregate number.

WASHINGTON, D. C., *December* 4, 1878.

A. C. BARSTOW sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. In Providence, Rhode Island.

Q. What business are you engaged in?—A. In manufacturing and commercial business.

Q. Have you had some knowledge of Indian affairs, or of the management of the Indians in any way?—A. I have been on the Board of Indian Commissioners for about four years—four years the coming March; and have given about one-fourth of my time to it.

Q. Are you one of the commissioners at present?—A. I am chairman of the board.

Q. Our business is, mainly, to ascertain what we can of the facts connected with the management of the Indian Bureau, and to get such evidence as is attainable in regard to the feasibility of a change; that is, whether it would be for the interest of the government or of the Indians to transfer the management of the Indian Bureau from the civil to the military department. Whatever you can give to the committee on that subject will be of interest. You ought, by this time, to have considerable knowledge in regard to the management of Indian agencies, and if you will in your own manner proceed to state whatever facts are within your knowledge on this subject it will be as well as to draw it out by particular questions.—A. Perhaps I ought to say, Mr. Chairman and gentlemen, that members of our board appeared here from a sense of duty which we owe to the religious bodies which we represent.

The law under which this board was organized is very general in its terms. Moreover, it is not mandatory. It was left to the discretion of President Grant to organize this board or not, as he should see proper, and, moreover, in any way that he should think best. He deemed it best to call to his aid the religious bodies of the country. The law proposes to civilize the Indians and to do what could be done, and he brought to his aid these religious bodies, who for long years have had missionaries among the Indians. He asked each of the religious bodies to recommend to him an able man to act upon this Board of Indian Commissioners. I represented upon the board the American Board of Commissioners for Foreign Missions—the oldest of all the missionary bodies in this country. It has its headquarters in Boston, and is con-

nected with the Congregational body of Christians. It was organized in 1810, and in fifteen, sixteen, or seventeen years after it organized its first Indian mission among the Cherokees, then inhabiting the southern slopes of the Alleghanies, and the islands of the Carolinas, and the States of Georgia and Alabama. Soon after, a few years after, they organized a mission among the Sioux, then in Minnesota; and I think about forty-five years ago they established one among the Chippewas on Lake Superior; and about the same time, or a little before, among the Nez Percés on the Pacific coast. I may say in regard to that mission that it was not known that the country drained by the Columbia River belonged to this country. We claimed it by right of discovery, but England claimed it also, and not until the treaty of 1840 did Great Britain recognize our claim to it. By the way, it must be said that Mr. Webster was about conceding that country to England for the right of the Newfoundland fisheries when Dr. Whitman came overland, heard of it, came to Washington, saw Mr. Webster, and begged him not to do it, and said that it was a great and valuable country. Mr. Webster had communicated with Lord Ashburton; and he appealed to the President, and the President told him that Webster took the ground that that country was separated from ours by mountain barriers. He told the President that he had come over in a wagon, and that he could lead a thousand emigrants back that way. The result was that we kept that country through the efforts of this board.

THE TRANSFER SHOULD NOT BE MADE.

The secretaries of that board have always been men remarkable for their wisdom, and the board itsel has been remarkable for its conservatism, composed of many of the most honorable merchants and business men of Boston and vicinity. To a man, the secretaries and members of the board are opposed to the transfer, after this long experience with the Indian. I used to attend the local and annual gatherings of the denomination with which I am connected in the State where I live. I was present recently at the annual gathering in the first week of October. They usually gather one or two thousand of the corporate and honorary members, and doubtless there were a thousand on this occasion. About two hours were given to the discussion of the Indian question and of the proposed transfer. Dr. Post of Saint Louis, and Dr. Simpson of Minnesota, Mr. John V. Farwell of Chicago, Hon. William E. Dodge of New York, and others spoke upon this question, and they all spoke on one side, at least so far as I know, that this transfer should not be made.

As I said, this judgment comes from men who have had large experience in Indian matters.

To the place I now occupy Mr. E. S. Tobey, of Boston, was first recommended, and he held the position for three or four years; then Mr. Harmon, of Chicago, who held it for a year or two; and I have held it for about four years. I tried to be relieved, but held it to oblige the board, not as a civil office, but simply because of my views of the fealty I owed to our common humanity and to the branch of the Christian Church to which I belonged. And this is true of other members of the board—Methodists, Baptists, and Presbyterians—some of whom are here to-day for the same object, and all of them qualified to speak as to the sentiment and unity of the great denominations which they represent. To make the transfer, it seems to me, would be in the face of the judgment of these men, who certainly not only have a right to be esteemed on account of their religious character, but also for their general intelligence.

THE TRANSFER IS THE QUICKEST AND READIEST WAY TO EXTERMINATE THE INDIANS.

The reasons given for the transfer are various. I met a merchant at San Francisco some time ago, who, when this question was mentioned, said, (and he did not know that I had any connection with the Indian Board), "Well, we have got to exterminate the Indians, and therefore I am in favor of turning them over to the War Department, to begin the work as soon as possible; and while we are about it," he said, "we ought to begin to pinch the neck of the agents as far as possible." I asked, "What agents?" He said "All of them." I asked him if he had any personal acquaintance with any of the agents. He said "No." I said, "You have now but two agents in your State." I have seen one of these agents, and I think he would compare very favorably with any one here in this room for honesty, integrity, and purity. I spent a little time at his agency with great satisfaction two or three years ago. No missionary board ever gave him a dollar a year, but he preached himself and organized schools and missions, &c., among the Indians, and employed a teacher to attend to their instruction, and he did it all on his own account, as a man, simply from a sense of duty. It was extra duty he was doing. If that is the motive of the transfer, of course there can be nothing said against it. If the transfer is made with a purpose of exterminating the Indian, that is the quickest and readiest way to accomplish it. Our humanity, our Christianity, are opposed to it; and I think, as I said to the committee of the House last year, it is time we had a governmental policy; not a shifting, varying one, but a permanent one, that should look with reference to the advancement of the Indians.

There is another reason given for the transfer; that is, the economy of the move. One of our Senators, Senator Burnside, I believe, said it would be best to turn the matter over to the Army, and then the retired officers could act as agents, and save that amount of money. I asked him if the War Department was understood to be noted for its economical management of public affairs, especially for economy in its civil administration; since, from my observation, I had supposed it to be the most expensive of our departments. I had seen something of it in connection with this board, and perhaps I instanced some circumstances; I will here, at any rate.

ARMY OFFICERS AS INSPECTORS.

I was at Sioux City a year ago last August to see about a large amount of supplies for the agencies on the Missouri River, and the inspector of supplies was an Army officer; I will not mention names. I was there five or six days, working as hard as I ever worked, ten or twelve hours a day. I had no assistance from the inspector. I had the use of his office, but he was out gunning every day but one that I was there. I found that all the work of inspection was done by a civil inspector on pay. The office of inspector there was merely nominal. Reports came of irregularities on the Missouri River, and among them was the charge that the brand of that inspector had been loaned to contractors. I do not know how true it was; I heard that rumor.

At San Francisco, the first time I was there to buy supplies—four years ago the coming spring—I was authorized to appoint a new inspector, if I deemed it wise. The inspector was absent for a time, and had left his business in charge of an inexperienced man, and I looked around for another. I went to General Schofield and asked him if he could detail a man to act as inspector; that the supplies were small and did not require much service. He named an officer stationed at Angel Island.

I had an interview with him the next day. He abused the Indian service a little, and said that he supposed it would be best to call in a few Army officers to give respectability to it; but I did not mind that. He said then that he would attend to this service, provided we would give him quarters in the city befitting his rank. I asked him what he desired, and he said, an office, a clerk, and quarters at a hotel; and after figuring up the cost, I found it would be twenty-five hundred or three thousand dollars a year. I said that officers were not expected to ask pay for civil duty; it was costing us about six hundred dollars a year for a civil inspector. I went to General Schofield and asked him to detail a staff officer, and permit him to have an office at the headquarters of the Army. He said no; that this was the only officer he could detail. I knew a paymaster, a young man of good qualities, and asked if he could not detail him; that I was sure he could find the time to attend to the duties required, but he declined.

Now, I must say one word in favor of an Army inspector, Major Boyle, of Portland. I found him to be a capital inspector, intelligent, capable, and industrious, and he did good service for the government; but when he was ordered to join his regiment, another was detailed. He at once asked for an office and a clerk, and his clerk was assigned to duty at fifteen hundred dollars a year; and the service of that inspector cost four times what it ought to have cost, and what it did under Major Boyle. That work could be done in thirty days' time.

I had a communication from one of our agents at Lapwai, Idaho. He was writing about a young Indian who had been educated—a son of a treaty chief, Reuben—who had acted as a teacher in a school at Lapwai, and was a teacher when he was there. He was chasing Joseph across the continent, acting as a leader of the scouts. The agent asked me what he should do, saying that he could not get a teacher for that school; Reuben had left. He had been demoralized by the very large salary paid by the Army. They paid him four times what he had been receiving as teacher, and he thought it unfortunate that such large wages had been given him, because smaller wages would have satisfied him just as well. That Indian was in favor of transferring the management to the War Department, and advocated it among the Indians, because the Army paid larger wages than the Indian Department.

This is out of the line of my observation. Whatever the Army touches it touches at a large cost. The Sioux war two years ago, it was generally understood by members of Congress, was a blunder. Our board had a consultation to see if that war could not be stopped. The Secretary of the Interior, and Commissioner of Indian Affairs, and the Secretary of War were present, and Bishop Whipple, who had just come down from the Sioux as a commissioner, was with us. Bishop Whipple took the ground that when the Indians were first struck the motive was to put them on the reserve; they were off the reserve hunting for buffalo meat, as they had a right to do under their treaty. He made that claim very distinctly, and no one denied it. The interview ran through an hour and a half, and the question came up, "What shall be done?" That war cost the government over two millions of dollars, beside the Regular Army expenditures. The question, "What can be done?" was answered by saying, "Call off those Crow scouts." He said they were the mortal enemies of the Sioux. You know that five or six Sioux chiefs came in to surrender themselves, and were shot by these scouts. If you want Indian scouts I can give you hundreds of them from the Sioux Nation as loyal to the government as any one in this

room can be. What next? The next thing is to send out loyal Sioux, and assure the hostiles of protection if they lay down their arms. They are afraid to come in and surrender, because those chiefs who attempted to surrender were killed. The President said to do that. Immediately Spotted Tail was sent out, and they commenced to surrender at once. It was really an end of the war. Another point, says he, restore to the agents their authority. The President asked how came that to be taken away; what was the reason for it. He said that provisions were going out from agents to hostile camps. Bishop Whipple answered, that is impossible; the agents had no provisions to be sent. Appropriations were not made until July, and the supplies did not reach the Indians until late in the fall. The fact is, three-fourths of Sitting Bull's forces were starved into their service. Besides that, every hostile camp you have taken has been provided with buffalo-meat.

One reason given for the transfer is that it is a matter of economy. The question of economy, let me say, that for this Board of Indian Commissioners your whole appropriation to cover all its expenses for secretary's salary and clerical hire, who approve every bill that is paid for Indian supplies, the whole appropriation was $15,000, and we paid about $14,000. You secure the services of inspectors on every purchase that is made, of as able merchants as there are in New York. Here is Mr. Kingsley; he gives one-fourth of his time to this business. I belong to the purchasing committee, *ex officio*, and give what time I can when they wish to call upon me. That is the whole appropriation for this board, which has not only the supervision of purchases, but also they report every abuse they see at the agency to the department, and if I suspect an agent of dishonesty or peculation, everything on which I base my suspicions is reported to the department. Now, a very small commission on what we buy annually for the government is equal to the whole amount of your appropriation for this board. Have you anything in the Army that corresponds, or can you expect to have? The Army is organized for war, not for peace; not to promote civilization, education, but for war. It is organized to subdue enemies. Can you expect that this board will work in harmony with the Army as with the Interior Department? Sometimes you meet with discouragements because of the conflicts of authority between Congress and the department, lack of appropriation, or something of that kind, but still we are working on, not simply to save dollars and cents, for we do not make it a dollar and cent question, but doing every day what we can to aid in securing an honest administration of Indian affairs.

Some articles, such as sugar and flour, we buy much cheaper than the War Department. I would like to have the committee make a comparison, and if you want samples we can furnish them.

By the CHAIRMAN:

Q. Your commission is authorized by the department to make purchases?—A. We work in connection with the Secretary of the Interior and Commissioner of Indian Affairs.

Q. They make the contracts for transportation?—A. Yes, sir; not always to our minds, but we always do the best we can.

TRANSPORTATION AND PURCHASING CHEAPER UNDER THE INTERIOR DEPARTMENT.

Q. Have you any knowledge of the comparative cost of transportation of those articles with the same amount of work done by the War

Department, or is there any difference?—A. I think we save in transportation, as well as purchasing; but I will call Mr. Kingsley after I get through. He will, I think, be able to give the committee more information than I can on that point. One point more. I remember when at Round Valley Agency, in California—Fort Wright had been closed recently—I asked the agent, "Are you sorry the military have been withdrawn?" He answered, "No; I am very glad indeed." Says he, "The influence of the post upon the Indians is very bad." In connection with that, I asked General Grant the first year I was on the board, which met at Long Branch, what he thought of the influence of an army posted in close proximity to an Indian reservation. He answered that it was demoralizing both to the Indians and white men. He said, "I have a great respect for a man who will enlist in the Army in time of war, but very little respect for a man who will enlist in a time of peace." I have not been among the wilder bands of Indians, but I have never met an agent where I have been in Dakota, Wisconsin, Oregon, Washington Terrritory, Idaho, and Nevada, who desired to remain close to the Army.

THE INDIANS SHOULD BE NATURALIZED.

Q. Have you visited any tribes that you think would require the presence of the military to-day to keep order, and protect the whites from them?—A. We are driving the remnant of Indians into the center of the continent from both oceans. You notice every State is trying to empty itself of Indians, and we are pushing 75,000 of them into Dakota and Montana. They feel uneasy, and feel that they have no home, no place to set their foot, and feel permanently settled. If they do not become irritated more or less, and strike back, it is strange. If this process goes on we will have greater wars than heretofore. The government should adopt a policy of absorbing the Indians as they do other nationalities as fast as naturalized, and give them homes. This board do not believe in pauperizing the Indians; give them lands, give them homes. Those Indians, the Santees for instance; let them have homes on the reservation where they are. I saw them, and they are certainly as quiet and orderly, and well-dressed, as most of our laboring population, and as peaceable as any one. So I certainly would have the government adopt some system, if they could, which would look to absorbing the Indians and disintegrating the tribes—breaking up the tribal relations—and they will give us no trouble. I saw the other day in Wisconsin a little remnant of the Stockbridge Indians—they came from Massachusetts ninety years ago—with whom president Edwards lived and preached one hundred and twenty years ago. They have been moved five times. They never ought to have come from Massachusetts. They went to New York, and from one place to another, until now they are all in northern Wisconsin. There is but a little band of them left. They are all civilized, and have an Indian preacher fifty-seven years old, educated in a New England college; I heard him preach a good sermon. He preaches in English, and they understand and talk English. There is no reason why that reservation should not be broken up. Wisconsin don't object to it. They have given land in Wisconsin lately to quite a number of Indians. I went to one clearing at Red Cliff Agency, where an Indian had a patent to eighty acres, two years ago, and I pushed for a mile through a dense forest and found that he had cleared six or seven acres, and in the middle of that clearing had a garden of two or three acres; taken off all the stumps and had as fine a garden as any New England farm, and had a large log-house, and was building a barn; had cattle, two cows, &c. He exhibited a great deal of industry, and was quite

proud of his home which he had acquired. It seems to me that this is the true policy, to give the Indians homes as far as they are civilized, and not exterminate them; and turning them over to the War Department, in the language of the San Francisco merchant, would be interpreted to mean extermination.

By Mr. McCREERY:

Q. What denomination do you represent?—A. The Congregationalists.

APPOINTMENT OF AGENTS BY RELIGIOUS DENOMINATIONS.

Q. How many appointments do you make?—A. One on this board.

Q. How many Indian agents do you appoint?—A. The Commission Board appoints none; the American Missionary Association appoints six or seven of the agents.

Q. How many do the Methodists appoint?—A. About the same number—seven or eight.

Q. The Catholics?—A. Eight or nine.

Q. And the Presbyterians?—A. About the same number. Some smaller denominations appoint less. I think the average is seven or eight. Our denomination embraces 3,500 or 4,000 churches.

Q. What church appoints the least?—A. The Unitarian, I think, have but one, and the Christian but one—they are smaller denominations. I was not on the board when that arrangement was made. Our Catholic friends claim they ought to have a larger number of appointments of agencies on the ground that they were teaching a great many Indians on Lake Superior, and also in the country we acquired of Mexico; and I notice one of their writers favors their transfer.

RELIGIOUS INSTRUCTION AT THE AGENCIES.

By Mr. SCALES:

Q. Is any other denomination than the one appointing the agent allowed to preach at the agency?—A. There has been some little trouble at White Earth Agency between the Catholics and the Presbyterians.

Q. Is that the policy of the department, to allow none others to preach? Is not that an exclusive privilege?—A. It has been the rule lately on account of the trouble at White Earth.

Q. That is the rule now?—A. That is the rule now, I think.

Mr. STEWART. The Catholics and Presbyterians are getting along perfectly well at the White Earth Agency since the new agent was appointed. It was the old agent who created all the trouble.

By Mr. SCALES:

Q. What is the policy of the department in regard to the exclusion of all the denominations except the one that appoints the agent. Is that the policy?—A. If I understand the policy of the Commissioner it is to secure the best services, and that two or three or four denominations pushing into an agency tend to obstruct. I think he wants to prevent that.

Q. He thinks, as I understand from your remarks, that the best results can be obtained by giving it exclusively to one denomination, so as to have no disputes?—A. Yes, sir; this little band of Stockbridge Indians have their own minister, and the Menominees and Oneidas have the same. The Stockbridge Indians are only eight miles from the agency, and the Oneidas twenty miles. The Episcopalians have a missionary among the Oneidas, and the Methodists have a missionary among the Menominees.

Q. I believe the chairman asked whether, in your opinion, the Army was at all necessary at any of the agencies among these wild tribes?

The CHAIRMAN. At any of the agencies he visited.

TROOPS NECESSARY AT SOME OF THE AGENCIES.

By Mr. SCALES:

Q. Is the Army at all necessary to the control of any of those Indians; and if so, to what extent?—A. I have no doubt it is the duty of the government when resistance is offered to overcome it, whether from Indians or whites. I suppose resistance to the government has been offered, and the Army has been called upon to suppress it. I went out as a member of a board of a commission of five to see Joseph. General Howard was one of the commission. We were there some nine or ten days trying to induce this fellow to go on the reserve. The committee very well understand that Joseph had never taken the life of a white man until he felt wronged. He felt that the land on which he had settled had been taken from him, and that he had been dispossessed of that territory; he wanted to stay where he was. We stated to him that the State of Oregon was organized over that territory, and that the local laws extended over it, and that the President could not protect him, and that he ought to go on the reservation and make the best of it; when we left him, we left him in tears because he could not stay where he was.

Q. You think the Army would be necessary in some cases now—A. I have no doubt of it.

Q. Do you look forward to any policy or any result which would make it unnecessary for the Army within the next ten or fifteen years?—A. I have no doubt in five years. The Sioux are wild, yet were they put under the wise administration of a wise Christian civilian who could have half the money the Army has spent on them, they would be raising cattle and self supporting in five or ten years.

Q. The Army entirely withdrawn?—A. Yes, sir; that is the opinion of men among them. Of course they are a good deal excited at present; pushed from place to place, here and there, they have become a good deal excited; yet, still, they would listen to reason if there was a permanent policy.

Q. I understand you are one of the present commissioners?—A. Chairman of the board this year.

COMPARATIVE ADVANCEMENT OF THE INDIANS IN CIVILIZATION.

Q. I notice in the last report (and I ask this for information, as it has a bearing upon this question, in your report) a comparison between the years 1866 and 1867, I believe, showing the advancement of the Indians in that time; do you remember it?—A. Yes, sir; I think I do.

Q. Have you ever drawn comparisons between any other two years from 1868 down to the present time?—A. I have not; I didn't draw that.

Q. The comparison was of the advancement made by the Indians in civilized life—the number of horses, number of houses occupied, and the number of acres of land cultivated, &c.?—A. I think you will see very rapid strides if you adopt the policy of giving them homes where they are civilized, or partly so. At this reserve, the Red Cliff at Green Bay, there are some who are raising cattle; a good many of them have now all the stock they need. They said to me, "We see white men come here very poor, with two or three animals, and get into a little hut the first year, and they break some land, and the next year they break some

more, and in a very few years their stock grows into flocks and herds.' And they say, "Give us an opportunity and we will do the same." They say "It is difficult to secure industrious habits in our sons because we do not know how long we are going to stay here, as the government may remove us."

Q. From the report of the Commissioner I instituted a comparison myself of certain years from 1871 down to 1877, and I find this state of facts, which I would like to have explained: I find in 1873 the number of acres cultivated was 297,475; in 1877 the number of acres cultivated was 292,550; in 1874 the number of acres was 317,213; in 1875 the number of acres was 329,327; in 1876 it was 318,194; in 1877, as I have just stated, it was 292,550?—A. I think some years the five nations were left out.

Q. I speak of the advancement outside of the five tribes. Can you give any explanation of that?—A. I do not know that I can.

Q. I understand that you cannot explain this discrepancy?—A. I have not given much attention to the statistics in figures, but I will ask Mr. Kingsley to do so. Our secretary is here, but has been sick, and I suppose would not like to be called upon.

REASONS FOR OPPOSING THE TRANSFER.

By Mr. BOONE:

Q. You said, I believe, that the missionary board of which you were a member was opposed to the transfer?—A. Yes, sir.

Q. And that they gave as one of the reasons; their opinion was a transfer of the management of Indian affairs to the War Department meant extermination?—A. No, I do not say the board gave that; I said a San Francisco merchant gave it.

Q. I understood you to say that was the belief of your denomination, if not the board?—A. No, sir; I do not mean to say anything of the kind. I spoke of the reasons given in favor of the transfer, and said the San Francisco merchant gave that as his reason.

Q. What is your opinion upon that subject?—A. I do say very frankly if we sought extermination of course we should place the Indians in the hands of those who would do it.

Q. Would not that naturally lead to the inference that it was your opinion that it would lead to that result?—A. I gave another reason.

Q. Answer the question, please. What is your opinion upon that subject, and the feeling of your denomination and your board, whether or not that would be the result of the transfer?—A. The common opinion is that the weaker tribes of the earth must yield to the stronger, and my opinion is that either we must have a policy which would result in extermination, or a policy which would result in an absorption of the Indians into our national life, the same as we absorb other nationalities. We have got to face one or the other of those propositions, either absorption or extermination. My opinion is that the Army is not organized for education, for civilization, for instruction, &c., but it is organized for war; and the tendency would be to exterminate rather than to civilize and educate. General Sherman said they could employ civil agents and Christianizing influences wherever they were needed, but my impression is the Christian bodies would not feel that it was worth their while to ask their leading men to spend a large amount of time gratuitously in an effort which to them seemed without avail.

Q. Your opinion is that the tendency would be to exterminate?—A. Yes, sir.

Q. Will you give a reason for that opinion why it would be so?—A.

You must have education, civilization, and christianization for the Indians.

Q. It is your opinion that the Army would not lend their aid to those influences?—A. There are very excellent men in the Army, but I do not think as a whole the Army would.

Q. Suppose if we make this transfer that the only change made would be to detail an Army officer to act as an Indian agent instead of the civilian, is it your opinion that that Army officer would not promote the objects of which you speak; that is, education, civilization, and christianization?—A. I do not see how they could do much without the aid of the religious bodies.

Q. If they were willing to co-operate with the religious bodies and allow them all the privileges they at present enjoy, is there anything in the mere fact of the agent being an Army officer which would prevent the religious bodies from co-operating with him?—A. Not if he was a good man.

Q. Whether they believed he was a good man or not, would that cause them to cease their efforts in that direction?—A. I speak of the two systems—one or the other—and the Christian sentiment of the country is very strongly in favor of a civil administration rather than a military.

Q. I want to get at the reason for that opinion in the minds of the Christian people.—A. I gave mine. So far as my denomination was concerned, in all their local conferences and anniversary meetings, and the largest gatherings in the country are of this denomination——

Q. Is it not a fact that in these gatherings speeches were made, some of which you have spoken of, and was it or not stated as a probable result of this transfer that it would amount to an extermination of the Indians; is not that the real idea of these religious bodies?—A. I do not know that these words were used. I think it would work to the injury of the Indians. That was the universal sentiment.

ECONOMY OF THE TWO SYSTEMS.

Q. You stated further, at least in substance, as I understood you, that to make this transfer meant necessarily an increase of the expenses necessary to govern them. Now, if an Army officer should be detailed as Indian agent simply upon his regular pay as an officer, which he is already receiving from the government, and receive no additional pay for his services as agent, how is it possible that that would increase the expense of the Indian government?—A. I stated, I think (and if I did not I will), that only in one instance have I found an Army officer who did work in this service when appointed. The work is all done by clerks.

Q. Is it not now by civil management done by clerks ordinarily?—A. Some have clerks and some do not. In some cases the wife of the agent is clerk at small pay. But I mean any ordinary duties the agent does himself. I have not seen an Army officer who would do that.

Q. You do not think an Army officer would do that?—A. He is not educated for that but for war, and knows nothing about purchasing of supplies. I would like it if the committee would compare the Army and Indian service for the last few years. If you want to see samples we can furnish them all to you.

By Mr. HOOKER:

Q. Are you acquainted with the manner in which the Sioux Indians of the Red Cloud and Spotted Tail Agencies have had agents appointed over them in the past?—A. The agents for those bands are recommended

by the Episcopalian body. I have not been in the Sioux country. I was once called there by the commission, but at the time I could not go.

Q. They constitute the largest body of the savage tribes?—A. Yes, sir.

Q. Are you aware of the fact that in 1872–'73 an officer of the Army was detailed for the purpose of acting as Indian agent, and that he was succeeded in turn by another officer of the Army and he by another, and that for three successive agents they had an officer of the Army detailed to look after the welfare of the Indians there?—A. I was not on the board in 1873, and had given no attention to Indian matters.

Q. You are not acquainted with that fact?—A. No, sir.

ARMY OFFICERS AS INDIAN AGENTS.

Q. If an officer of the Army should be detailed to act as an Indian agent, would he not have under him a farmer and blacksmith, and, if they had milling operations, an engineer to conduct the mill, if carried on by steam, and would he not require the set of men who are now kept at the respective agencies, precisely as if the agent were a civilian?—A. Yes, sir; but the inquiry arises would he be qualified to direct them.

Q. The question is addressed to that directly—whether he would not necessarily employ precisely the same civil list as if he were a civilian agent?—A. I suppose that would depend upon the law under which he was acting.

Q. Acting under existing laws and usages, as at present?—A. If the Interior Department under present law could appoint an Army officer, then, of course, he would have all the other subordinate appointees under him. But if the law was changed by turning the management over to the War Department, I do not know what the requirements of the service would be.

Q. Suppose an Army officer was detailed without any change of law after the transfer was made, would not the existing law, unless changed by the legislative branch of the government, still keep all the civil officers at the agency?—A. The law might do that or might not. If the administration was turned over to the War Department, civilians or officers might be employed for all these services.

Q. It does not follow if an officer was assigned to duty that he might not keep civilian officers in these places, does it?—A. No, sir. In all our manufacturing interests, we believe the head of the establishment should be able to govern, lead, direct, and inspire the subordinates. The inquiry arises whether a military officer would be qualified to inspire his life into the subordinates in civilizing the Indians.

Q. Do you think a military officer like General Crook, of the Division of the Platte, who spent twenty-five or thirty years among the Indians, would be less qualified than a man from New York or Philadelphia to inspire these subordinates with a proper sense of duty?—A. I am not acquainted with General Crook.

Q. You know his history, do you not?—A. Not minutely; no, sir.

DISMISSAL OF AGENTS FOR INFIDELITY.

By Mr. McCREERY:

Q. How many agents have been dismissed for infidelity and improper practices since you have been chairman of the board?—A. I have only been chairman of the board during this year. I think three or four, maybe four. Our board is not consulted with regard to dismissals of agents.

DIVIDED JURISDICTION.

By Mr. SCALES:

Q. Is it not necessarily, under the present divided jurisdiction between the War and Interior Departments, very embarrassing to those in charge of Indians?—A. I do not know why they should be; both are under the President.

Q. Is there no division of authority, you think; no divided jurisdiction?—A. There has to be a division of authority in the Army, as from the General down there are a great many subordinates.

Q. But one controls the whole; all is under one department? In the management of the Indians, are they not embarrassed frequently by this division of jurisdiction between the two departments?—A. I do not know why they should be. Mr. E. M. Kingsley is chairman of the purchasing committee of our board, and perhaps he can testify on those points.

E. M. KINGSLEY sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. I reside a few miles out of the city, but my office is in the city of New York.

Q. What has been your occupation?—A. I am out of the mercantile business, but I have an office and the treasurership of an institution in the city of New York.

Q. Have you had any connection with the Indian business in any way, as commissioner, or anything of that sort?—A. Yes, sir.

Q. Please state to the committee what your position has been.—A. I have been a member of the Board of Indian Commissioners by the nomination of the Presbyterian Board of Foreign Missions, since, I think, February, 1875.

Q. You are still a member?—A. Still a member, and for the last two years I have been at the head, and occupied the position of chairman of the purchasing committee of that board.

Q. We are trying to get at such facts as we can with regard to a change of the management of Indian affairs from the civil to the military department of the government. It is thought to be advisable by some to make a change—that it would be better for the government and the Indians—and various questions arise as to the economy and as to the future good of the Indians, &c. Some have advocated a change. The committee would like to have your opinion upon that subject, and such reasons as you are willing to give for such opinions, as to whether it would be better for the government, or the Indians, or both, to make the change and turn their management over to the War Department.—A. In a general sense, I should say this would be determined by what the ultimate purposes of the government are in behalf of the Indian tribes. I am not prepared to say that the transfer to the War Department necessarily means extermination, but I think there is a good deal of common sense to be used in the adaptation of means to an end. If we as a Christian people, a humane people, and an intelligent people, seek to develop and bless this people upon whose domain we have crowded ourselves, I think that our line of duty is plain in the premises.

I think the government for the past few years has been endeavoring to carry out what may be called a wise, humane, and Christian policy toward the Indians, and the administration of that service under that policy has naturally divided itself into three or four divisions, all of which are essential to the end aimed at.

EDUCATION AND CIVILIZATION NECESSARY.

First, there is the need of education. That means teaching the children of the Indian tribes to read and write and transact the ordinary business of life. Another one is in the line of industrial habits—the training of them to habits of industry, looking toward civilization. This means leading them (not ordering them)—leading them into the field, taking them by the hand, and showing them how all agriculture and other departments of manual labor can be accomplished. Another department may be called the mercantile department of the service; that is, the purchasing, handling, shipping, and, I may say, the selection—careful, wise selection—of the supplies which the Indian tribes need, covering a very wide field and vast number of articles, many of which an Army officer would not know what they are used for. This, I say, is the mercantile department. There is another essential element which perhaps does not come so directly under the administration of the service, but it falls into the line of civilization, and from a recent visit with the Commissioner of Indian Affairs to some six or eight agencies in Indian Territory, I am impressed more than ever before with the importance of domestic life as a factor in Indian civilization. I don't know how civilized either of us would be if we went on the farm during the day, or to our offices, and went home to barbarous homes at night. I think that much has got to be done, either by philanthropists, or humanitarians, or moonshiners, if they choose to call us such, in the line of elevating and ennobling Indian domestic life. I have noticed that the women hold with a great deal more tenacity (at least that is the result of my observation) to the habits of savage life than the men.

THE ARMY NOT ADAPTED TO CIVILIZING THE INDIANS.

Now, I designate four particulars: One, education; another, habits of industry; another, the mercantile department; and another, the domestic life. Now, I think clearly that the Army is unsuitable to and is not adapted to either of these. I might extend my remarks in that direction, but I think I have only to indicate as far as I have, and you must at once see what my mind is and what conclusions I have arrived at.

There is my first point, the utter inadaptation of the Army officers as they are ordinarily constituted. They do not carry their families there, and there is no example of domestic life. I am going back to that. I visited, on the invitation of the Commissioner of Indian Affairs, the Nez Percé, Modoc, Osage, Ponca, and Pawnee Indians. It was a rapid-transit trip. Our trip through the Territory occupied only about three weeks' time There is the wife of one of the agents there that is competent and fit to do more good than all the other agents together, in the attraction of domestic life. She is a woman whose whole heart is in the work. If the Indians are sick, she goes right among them and administers to their wants; and that example of noble life, that self-sacrificing life, is on the part of a woman of refinement. I think her influence there will be of incalculable value upon the homes of the Indians, if she can remain there among them.

EIGHTY PER CENT. OF THE INDIANS DO NOT REQUIRE THE PRESENCE OF THE ARMY.

I will pass to another item. My judgment is that the Army in diminished numbers is needed. It is needed in the Indian service just exactly as it is needed once in a while in our States. Eighty per cent., in my estimation, of our Indians are infinitely better off without any army near them, and I hold that it is unwise and impolitic for us to subject the

80 per cent. of our Indians to the iron heel of military rule for the sake of the 15 or 20 per cent. I hold that is true among the Indians, as it was true a year ago in Pennsylvania, when the strikers arose in the railroad riots. I think 15 or 20 per cent. of the inhabitants of that State and some others were in a state of insubordination, and the military was needed to regulate and control them and keep them in subjection, and the military arm of the government should be in the background, not the front. It is absolutely indispensable, and I should rather see it augmented than diminished; but for the Indian service we want an army with spades and hoes, and not swords and rifles.

I want to call attention to another point, and that is the integrity of the present service in the distribution of supplies. For four years now it has been my duty to be more or less intimately connected with this part of the service. During the last two years it has come directly under my eyes, though year before last I was sick about a month at a time and could not be in the field and watch it day by day, but last summer I spent three solid months, taking but two Saturdays to stay at home and lie down and rest. In this service I watched everything; I think every contract passed under my eye, or nearly so. Nearly every purchase passed under my eye; I inspected nearly every article; nearly everything that was inspected passed under my eye, and I certified to their accuracy and to shipment; and I have a book in my office giving a faithful record of every package of goods coming into our office, and where it has gone.

PRESENT CIVIL AGENTS HONEST.

We hear frequently of the rascally Indian agents. I tell you, gentlemen, that I don't believe it. There are seventy-five agents, perhaps, and I don't think you can find seventy-five men in any other business but that some of them are, in some respects, incompetent or unfit for their places; but they will winnow themselves out after a while. In the main, these are men of character and integrity, much more so than I should believe you could procure to isolate themselves from all the amenities of civilized life, and give bonds of say twenty-five or twenty thousand dollars, for the sake of a twelve-hundred-dollar salary. It is a good deal to ask of an agent to undertake such a job. I hold that the service, so far as agents are concerned, may be spoken of with a great deal of confidence for their integrity. Some of them are inexperienced, and nothing can be said against them but their want of experience. Their want of experience sometimes, I think, measurably unfits them for the place. We would like to have better men if the salary would enable us. The department feels that, and we feel it. This wholesale abuse of agents I want to put my foot upon. I believe, as compared with ten years ago, they are, at present, better as a class. They have improved to a vast extent within the last ten years, and by constant vigilance and oversight they can constantly improve still.

THE GOODS PURCHASED ARE DELIVERED TO THE INDIANS.

I have every reason to believe that, substantially, the goods we buy are delivered to the agents, and by the agents delivered to the Indians. What the Indians may do with them, I don't know, but I make this as a general remark. Here and there may possibly be small exceptions, yet I cannot say there are. I do not know of a solitary one. I found some goods, in my recent visit with the Commissioner, some barrels of sugar, that were in a wretched condition, and the agent was culpable for never having reported it to the department. There were some fifty barrels of it. The agent is removed. I think, however, that this sugar business

is a business about which nobody knows anything. The inspector this year is one of the oldest refiners in the city, and he confessed to me that he did not know anything about sugars; that they adulterated them so much that they will lose quality and color by lying long. These barrels them laid for a year, at least, and I cannot learn that he ever reported have as being on hand. There is a thing that has deteriorated since the goods were delivered. I think the goods were pretty nearly up to the grade at the time we received them and shipped them. To show you how universally well known this is in the trade, the inspector this year, after making our awards, begged me to put these samples of each award we made in glass bottles with glass stoppers, and keep them air-tight, that the samples thus might not deteriorate, and in receiving goods that we might keep them up to the standard. On these two points I wish to be emphatic: as to the average character of the agents, as compared to former years, and with regard to the integrity of the delivery and of the service generally, so far as the furnishing of supplies goes.

I need not say anything on the subject of economy. I think that a careful and impartial investigation will show that the service of the Indian Department is conducted at certainly as little expense, or nearly so, as it could be by any officer, if the Army and the War Department were as pure as they claim to be. The purity of the War Department management is a question which rankles in the memory of some since the war. I don't know anything that equals the rascally contracts of the War Department during the war. I don't accept criticism from that quarter after the rascally contracts of that period.

ECONOMY NOT TO BE CONSIDERED.

Considerations of the question of economy I set all aside. It is a pitiable sight for this nation welcomed to this country—and the first intelligible word that dropped from the lips of the savages of Massachusetts was "welcome"—I think it is a pitiable sight for this country to talk about the economy of a few thousand or even a few hundred thousand dollars in discharging the great obligation which we owe to this people.

INSPECTIONS BY ARMY OFFICERS.

We have had some specimens of Army inspection. A year ago word came to me as chairman of the purchasing committee, through the department, that an Army officer had inspected some goods and had reported very unfavorably upon them. We ordered samples sent to New York, at a cost to us of some eighty-five dollars, I think; between eighty and eighty-five dollars. We opened them, and in every solitary instance they compared exactly with the samples. Bear in mind, we retain these samples in our custody until the year's transactions are closed, so we can compare. We found every solitary article was identical with the goods that we purchased. Now, just another repetition of that on hand. The Army speaks contemptuously of certain goods, and I have ordered samples into my possession, and I have not the slightest expectation but that they will be just as I expected. Mr. Barstow has already told you of the examination at Sioux City. An Army officer was detailed for that purpose. He went in and delegated the work to a civilian. The Army officer could not make any charge, but the civilian could, and there came in a bill for about five hundred dollars for inspecting those goods. After these and some other occurrences which I might relate, I have come to the conclusion that the Army is just as good as any of us, a good average, but no better. They don't belong to the Immaculate Conception any more than the rest of us.

AGITATION OF THIS QUESTION DETRIMENTAL TO THE INTERESTS OF THE INDIANS.

Another point I wish to speak about is this: The work of civilization of the Indians has been greatly hindered by the agitation of this question by Congress as to transfer. If you are going to consign them to the sword, do it, and let it be as a settled policy; but if you are going to follow up this tedious life-long work of elevating these poor creatures to the plane of civilization, let it be a settled policy, for they are very much disturbed from its being agitated year by year. I don't know that I need to occupy any more of your time. I have said all that I care to say.

I will, however, add one remark in the line of Mr. Barstow's statement. He has said he is here in a representative capacity. I feel that I am. I would not stay here a day and undertake this labor but for the interest I feel in carrying into good effect what is known as the peace policy—I mean the civil policy—for the Indians. I am here upon the nomination (which I knew nothing about until I got my commission) of the Presbyterian Board of Foreign Missions. They designated me to this service. That board is the leading board in the charities of a church which numbers five thousand churches and five hundred thousand communicants; and I may speak for the unanimity of sentiment among the Presbyterian body on this subject. I am authorized to say that the Baptists, who have a membership of something like two millions, are, you may say, unanimous. I think the Methodists about the same. In the religious bodies over the country I find no division to speak of. There may be individuals who will entertain different opinions, but the great mass of public sentiment among these religious bodies is in favor of the civil policy so far as I have ever discovered it.

TRANSFER TO THE ARMY MEANS MILITARY RULE.

By Mr. BOONE:

Q. I understand you to mean, when you say that if you are going to consign the Indians to the sword let it be a settled policy, that the transfer of the Indian Bureau to the War Department transfers the management to the Army exclusively?—A. You will find, I think, in my judgment at least, that it will result in a military rule.

Q. Is it your opinion that it would require any more soldiers in the Indian country with an Army officer as agent, than it does at present with a civilian?—A. My opinion is that the presence of soldiers among the Indians is just as unsavory as it has been to some of our Southern States among the white people.

Q. I am not speaking of a body of soldiers sent to the Indian territory. If an Army officer is simply detailed to transact the business of an agency, does that necessitate more soldiers in that community than if that business were transacted by any other man?—A. With the exception of about 20 per cent. of the Indians, I think we really have no occasion for the presence of soldiers any more than we have in the States at present. Our States require State militia. It is known that it is there and can be brought into requisition to enforce law and order. That is about all we need at many agencies and among many Indians.

NO MORE SOLDIERS NECESSARY IN THE EVENT OF THE TRANSFER.

Q. I want to get your opinion whether or not it will require any more soldiers if a military man conducted the business than with a civilian to do it?—A. I do not think it would.

Q. Is it not necessary now that soldiers be stationed at some parts of

the Indian territory, and could they be withdrawn with safety?—A. In some parts of the country I think they ought not, sir. I hold that just as in our States there is a necessity——

Q. Please answer my question. Under the civil management the presence of these soldiers is necessary?—A. At some of the agencies, but only in a small minority.

Q. If you were to change the agent from a civilian to an Army officer at any of the agencies would that necessitate soldiers where they are not now necessary?—A. I don't think it would. I don't know whether they would be placed there simply as agents or whether they would be detailed from a post in the vicinity, or what the plan would be under this military policy.

INFLUENCES OF DOMESTIC LIFE.

Q. You have spoken very positively and correctly and justly, I think, on the subject of the example that ought to be set to the Indians, especially in the domestic circle and domestic life. Is it your observation that it is the rule with the women of the agents to go among the Indians, familiarize themselves with them, and welcome them to their homes and set them a personal example in domestic life?—A. My only personal experience and observation has been in the trip among the Indians that I have recently made. I found in two or three places where the wife was with a child in her arms, but I don't know that they petted and invited the Indians to come in; but they did come in and saw their habits of living. I spoke of the Christian influence of those women who went out and exerted a positive influence.

Q. You do not say it is a general rule?—A. It must be looked after.

Q. You think it ought to be. Is that the general rule now?—A. I think it is now, so far as my observation goes. I can only speak of those that I saw.

Q. You speak about the efforts of Christians to elevate this people in every respect, and also of the teachers to teach them. Is it your opinion that if this transfer is made that the Christian people would cease their efforts, and would your board for one hour cease your efforts to christianize these people in the event of the transfer?—A. Which board do you refer to?

Q. The Board of Foreign Missions.—A. They are conducting their missions, as far as they can, as they formerly did. But one reason why they opposed the transfer was that in the event of a change all their missionary efforts would be doubtless rendered nugatory by the example and conduct of the surrounding military posts, and by agents who were placed there for other reasons than the civilizing process. In the first place, you remember, it passed from the Army, and strong reasons led to its being transferred, and then it became a place for political patronage, where these agencies were filled with applicants for political appointment, and it was found they were running in opposite directions; one was encountering the other. That was one of the fundamental reasons which led to the change and the bringing about of a harmonious co operation between the governmental operations at each agency and the military of the agency. It was found that they should be in sympathy.

Q. Do you think there will be less co-operation between the War Department or a military officer and your missionary operations?—A. I do not think the Board of Missions would feel they had any active sympathy with or any control or direction over them.

Q. Could not your present object be just as well carried on in connection with the War Department as with the Interior Department? What

connection have you with the Interior Department?—A. I do not know that there is much by law, but there is much by agreement and understanding. We are at work with a common understanding. The question was asked as to the religious bodies and their mingling or coming in contact; I think that was all by agreement.

Q. Do you suppose that the same agreement could not be obtained with the War Department?—A. I do not know.

Q. Is not your board crippled in its efforts by the very fact that the practice is now to farm out the different agencies to the different denominations? Would it not be better to throw the whole Indian country wide open and allow all churches to go there and work?—A. I do not think they would desire that; but if a law was passed they would acquiesce.

Q. What is your judgment?—A. It would be against it. I think it is felt now that there is a gain in having particular tribes or agencies assigned to particular missionary boards.

Q. Is there not already a conflict between different Christian denominations upon this very subject, and is it not growing in importance every year?—A. Not a bit. If there is any objection to this policy being carried on (I do not know that there is; I simply speak because I never heard of there being any) it would be on the part of the Catholics.

Q. There may be some objection by the Catholics?—A. I do not know that. I say that because I have never met with them.

By Mr. HOOKER:

Q. You have spoken generally in your direct statement to the committee of the great fidelity with which the majority of the agents appointed at the various agencies have conducted their business; are you not aware of the fact that there have been a great many defaulting agents and contractors under the system as now existing in the Interior Department?—A. You are speaking of contractors; that is another subject which I did not touch upon.

Q. I am asking a question; please answer it as I asked and I will explain the reason for it further on.—A. If there were I do not know. Some have been detected and have been exposed.

Q. Do you know how many agents, who have been unfaithful to their trust, have been successfully prosecuted by the government?—A. No, sir; I do not know.

Q. Are you familiar with the recent report which has been made by the Commissioner of Indian Affairs?—A. I have looked it over.

Q. You spoke of a single instance in which you discovered that there was defective flour furnished to one of the tribes?—A. It was sugar.

Q. Where was that?—A. The Osages.

Q. Is this visit which you made in connection with the Commissioner of Indian Affairs the only one you have ever made?—A. Yes, sir.

Q. That constitutes entirely your experience, so far as actual contact is concerned?—A. Yes, sir.

Q. That occupied how long a time?—A. Between two and three weeks.

Q. Did you hear any complaints at the Quapaw Agency from the Nez Percés or Modocs as to the character of the food furnished them?—A. I did, sir.

Q. What did you hear?—A. I heard through their interpreter that a carcass of beef had been furnished them which was rather small, and that he had the curiosity to weigh it, and it weighed something like two hundred and twenty-five pounds.

DEFECTIVE SUPPLIES ISSUED TO THE INDIANS.

Q. Did you hear any complaint about the character of the flour furnished either to the Nez Percés or Modocs?—A. The interpreter had two or three or four items of complaint. One was this matter of beef. In the evening the interpreter came in the presence of the son of the agent; the agent, we were informed, was away.

Q. What was his name?—A. Jones, I think. His son was there, and the interpreter came in the presence of the Commissioner of Indian Affairs and stated his grievances. I did not happen to be in hearing distance when that took place. It called our attention to the cattle. We went and found a herd of about one hundred head of cattle that certainly were very poor cattle. We tried to find out by whom they had been receipted for, and we learned that they had been handed over from the Poncas, who had been removed from the Quapaw Agency to another region, and the officer who had receipted for them had been dismissed and left.

Q. What is your position?—A. Chairman of the purchasing committee.

Q. Purchasing committee of what?—A. Of the Board of Indian Commissioners, whose duty is defined in our by-laws. We are to take cognizance and supervision of the purchases that are made by the department in their general contracts.

Q. Purchases made by the Interior Department?—A. Yes, sir; for the Indian service.

MANNER OF INSPECTING INDIAN SUPPLIES.

Q. And do you, in point of fact, inspect them all?—A. We call gentlemen to our aid in the process, as, for instance, under the purchases have been received a great many kinds of dry goods, and barrels of sugar and coffee, &c., and we call to our aid in making an award, which is done in connection with the Commissioner of Indian Affairs, or a representative of his, men of character and well-known reputation in their several branches of trade, whose names shall be the guarantee to the community of integrity in the work. We nominate them and the department appoints them as inspectors, and we avail ourselves of their experience and knowledge in determining the awards. Then when the award is made we keep in our own custody the samples upon which the awards were made, and then as the goods come in this inspector is sent for to come and inspect the goods and certify thereto.

Q. Do you think this class of inspectors which is selected by your board is any more competent than the inspectors who are appointed under the commissariat regulations of the War Department?—A. My experience of four years is this: that I should never call in for this service a military inspector if I could get a mercantile one.

Q. That is the manner in which you make the inspections?—A. Yes, sir.

Q. How is it ascertained in the present system that the goods selected by your officers reach their destination?—A. Our board has been in the habit each year of sending out some reliable man whom we know to be competent, whom we knew and could have confidence in, to visit all or such as he could of the leading agencies, and his instructions always require him to examine into the character and quality of the supplies.

Q. Is he appointed by your board or the department?—A. By our board, and goes out by authority of the department, which gives him access to everything.

Q. Is he an officer under bonds?—A. No, sir; not under bonds. We have sent out a man this year we have had in the department office

while these goods were being shipped, so he will be more completely familiar with them.

Q. He is reponsible alone to the board?—A. Yes, sir; and, moreover, I wish to say that in all my visits recently I took pains myself, being familiar with almost everything, to go through their commissariat department.

Q. That is, in these three weeks visit?—A. Yes, sir; and inspected all the goods I could get my eye on there. I found nothing there that had gone from New York but what was all right.

Q. You rely upon the report of this inspector?—A. If a question arises we send for samples.

Q. You rely entirely upon this report of this officer who is under no bonds to the government, department, or anybody else for the accuracy with which the goods selected by you are transmitted to the point of destination, and whether they correspond to the samples as to quality of those purchased?—A. Yes, sir.

Q. Generally speaking, you do that?—A. We rely upon his report and the samples. There are other members of the board who visit other places. That is the first thing we look after, the character of the supplies.

Q. To what particular places do you send from the board?—A. I think the last two years through the Indian Territory.

Q. You mean the five semi-civilized tribes?—A. Yes, sir. This year I found we were expending $400,000 among the Indians of Arizona and New Mexico, and no one from our board has been able to go there for three or four years. I think that is a large amount to be spent without inspection.

Q. He is under the authority of your board, and not the Interior Department, and alone responsible to the department?—A. He has no pecuniary responsibility; no, sir.

Q. He has no bonded responsibility?—A. No, sir; he does not receive any money.

Q. Gives no bond for the faithful discharge of the duties of his office?—A. No, sir; there is over and above this board three general inspectors who are bonded men.

Q. I am speaking of the operations of your own board?—A. Yes, sir.

PROSECUTION OF DEFAULTING AGENTS.

Q. Are you cognizant of the fact whether there have been any successful prosecutions before the civil courts of defaulting Indian agents, where they failed to faithfully discharge their duties?—A. I have understood there were some suits in process, but I do not know the result.

Q. Do you know whether there has been, and, if so, how many, absolute convictions of men who have been indicted by the department, who have defaulted as Indian agents?—A. I do not know, sir.

WASHINGTON, D. C., *December* 6, 1878—10 o'clock a. m.

Hon. CARL SCHURZ, Secretary of the Interior, sworn and examined.

The CHAIRMAN. This committee is charged with inquiring into the expediency or propriety of changing the management of Indian affairs from the civil to the military department. We would like to hear from you on that subject. Anything that may be related at all to that management, showing whether it would be better for the government finan-

cially or otherwise, or whether it would be better for the Indians that the bureau should be changed or whether it should remain as it is, would be proper for you to state. We would be glad to have you make a general statement, and we will afterward propound such questions as we may deem necessary.

The WITNESS. If it pleases the committee, I should desire to present what I have to say in a connected form, so as to give full expression to my views.

At the outset, it is, perhaps, proper for me, as the head of the department of which the Indian Bureau forms at present a part, to say that, in the opinions which I have formed and the statements which I have to make, the desire or ambition to keep the supervision of Indian affairs in my hands has no part whatever, for, as you are probably all aware, there is no duty more burdensome, more perplexing, and more thankless than the management of Indian affairs. Whenever things go well nobody takes any notice of it; but whenever anything goes wrong it is charged to the account of the department, with severe censure, and sometimes with vituperation. So, if a man has any ambition to distinguish himself, he ought not to seek this line of duty. If I were convinced that the transfer of the Indian service to the War Department would be for the good of the Indians, or would serve the best interests of the government, I should be the first man to advocate it.

Likewise I desire emphatically to disclaim any unkind feeling toward the Army, in which I have a great many friends.

For the gentlemen at the head of military affairs I entertain the most respectful and cordial feelings. There is probably not in any branch of the government a gentleman with whom it is pleasanter to have social or official intercourse than General Sherman. We are friends to-day, as we have ever been.

I might say since I have been charged with my present duties as the head of the Interior Department, I have given careful attention to Indian affairs, more perhaps than to any other branch of the service under my supervision. The opinions, therefore, which I formed were formed with great care.

I am firmly convinced that the Indian service should be controlled by the civil administration; that it is best for the Indians; that it is best for the government, and that of all branches of the public service the military is the one to which the control of the Indians should not go. I think that the demand for the transfer of the Indian service to the military administration is based upon assumptions and upon reasons which, in the great part at least, are not founded on fact. This I think I shall be able to show.

Permit me first, a few remarks of a general nature. There are two methods of Indian management. One is to herd or corral the Indians under the eyes of a military force, so as to watch them; the other is to set them to work upon lands which, in the course of time, they may call their own; to start them in pastoral or agricultural pursuits, and educate and civilize them. In the nature of things, the first would be the military method, for the simple reason that it is their usual business to prevent or repress trouble and mischief by a show or the application of force. The second is the line of policy which the civil administration has been endeavoring to carry out. I think it is evident that this latter policy—setting the Indians to work, educating, and civilizing them, is not only the most humane (and surely they are entitled to humane treatment), but that, in the long run, it is also serving the interest of peace best.

As long as the Indians remain wild, roaming tribes, going from one

place to another, and coming in unfriendly contact with the whites, we shall always be liable to have trouble. When they have settled down to work and have private property to take care of, they will become conservative and peaceable. The more usefully occupied and educated they become, the less potent will be their warlike instincts and propensities. Hence the civilizing policy is undoubtedly the one which will prove most conducive to peace.

It is also the most economical in the long run. The sooner they become able to provide for their self-support the more the government will be relieved of its burden. We frequently hear doubts expressed as to the possibility of setting Indians to work. It certainly appears at first sight very difficult. That the Indian is originally disinclined to work is conceded. But when we look at some of the tribes in the Indian Territory, and some other tribes elsewhere, we see many of them working, perhaps not as efficiently as the whites, but yet they do something toward their own sustenance, and some of them positively are self-supporting. What these Indians have accomplished, others can accomplish. If the Indians cannot be raised to the degree of civilization of the whites, they are at least capable of rising to a higher level than they occupy now, and it is our bounden duty to raise them up to it.

We can set them to work as farmers or herders; we have been trying the experiment at various agencies, of using them as teamsters, to haul their own supplies, by which, in the first place, in the course of time money will be earned by them and saved to the government; and, in the second place, it imbues them with a sense of responsibility for their own provisions, which they convey to their camps and settlements. It seems to me that for the work of civilizing them and setting them to work, for educating them, for gradually raising them up in the industries and moral habits of civilized life, the military branch of the government is not the fittest instrument, and for this I have very good authority, which I am going now to quote. I find in a report which has attained some celebrity the following statement:

> This brings us to consider the much mooted question whether the bureau should belong to the civil or military department of the government. To determine this properly we must first know what is to be the future treatment of the Indians. If we intend to have war with them, the bureau should go to the Secretary of War. If we intend to have peace, it should be in the civil department.
>
> Under the plan which we have suggested the chief duties of the bureau will be to educate and instruct in the peaceful arts, in other words, to civilize the Indians. The military arm of the government is not the most admirably adapted to discharge duties of this character. We have the highest possible appreciation of the officers of the Army and fully recognize their proverbial integrity and honor; but we are satisfied that not one in a thousand would like to teach Indian children to read and write, or Indian men to sow and reap. These are emphatically civil, and not military, occupations.

You will remember that General Marcy, as I have seen stated in the newspapers, quoted a part of this report also, and stigmatized it as eminently puerile and absurd, attributing it to some Commissioner of Indian Affairs. But this report is signed, and certainly not inadvertently so, by William T. Sherman, then Lieutenant-General of the Army, Brig. Gen. William S. Harney, Brevet Major-General Terry, and Brevet Maj. Gen. C. C. Augur. It is the report of the Sioux Commission, made in 1868. If General Marcy insists that this statement is puerile, he will have to address that remark to the General of the Army. It may be said it is overdrawn. I do not think so. There are undoubtedly in the Army a great many gentlemen with good ideas of the Indian service, but it is one thing to have good ideas and another thing to carry them out. The business of civilizing Indians is a business which requires very careful, laborious, and patient work. Above all things it requires

patient labor to guide the Indians in their efforts to rise from a barbarous state; to control the education of the young; to instruct them in practical work, where the instructor must put the hoe and plow into their hands, gradually accustom them to habits of industry, and keep demoralizing influences from them. It is just that kind of patient labor, as a general thing, in which a military officer, with his education and habits, would be most liable to fail. I think it is eminently a civil function, and in that respect Generals Sherman, Harney, Augur, and Terry were certainly right.

By Mr. SCALES:

Q. Did not these same gentlemen make a different report, in which they recommended the transfer a short time after that?—A. I do not know of these gentlemen making a different report, recommending the transfer. They recommended the organization of an independent Indian Department.

Q. I think you will find in the same report that they met in Chicago and recommended a change.—A. Possibly. I should be sorry if their opinions did not keep over night. I have no reason to think their opinions, as expressed in the report quoted, were hastily formed. The report is very carefully drawn throughout. At any rate, from what they say it may be assumed they once thought it. In what they then thought they were eminently correct, and I fully agree with them. That the Army is necessary for subduing unruly or hostile tribes is undoubtedly true. Sometimes the Army is called upon to do that thing. I learn the argument is made because the Army from time to time has been called upon to check disturbance and hostile outbreaks, and has to throw itself into the breach, that therefore the management of Indian affairs should be turned over to it. It seems to me this argument is entirely inconsistent with the spirit of our political institutions. It seems to arise from an entire misapprehension of the position of the Army in our political system. The Army is a most honorable body. When they are called upon to defend the country, it is a great honor to be one of them. They honorably acquit themselves of their duties, and for that no good citizen is unwilling to give them high credit. But the Army, after all, is a mere auxiliary force to the civil government of the country, to be called upon when force is necessary to carry out the law and to sustain the civil authorities. The argument that, because the Army has to subdue hostile tribes, therefore the whole management of the Indian service should be turned over to them, is logically equivalent to this: The State Department may sometimes be carrying on correspondence with foreign countries liable to involve us in war. Of course that war will have to be fought by the Army. Now, says the Army, if you get us into trouble, we shall have to do the fighting, and finally to pay the cost with our blood. We want you to turn over the management of the whole affair to us, for perhaps we may avoid disturbance. Would that be consistent? Sometimes in the collection of the revenue the Army has been called upon to aid in enforcing the revenue laws. Suppose the Army says to the Treasury Department, you don't know how to manage this thing, and you are getting us into trouble; therefore turn the collection of the revenue over to us. Here is Texas with her border troubles. Suppose the Army says, the State Department and the State government cannot control this; therefore turn over to us the government of the State of Texas. Again, there is New Mexico. The civil government was recently unable to control the outlaws in Lincoln County of the Territory; suppose he Army says, as you are unable to subdue the outlaws, turn over to

us the government of New Mexico, because we may have to subdue the trouble by fighting. That argument certainly does not hold.

It is also said that the red tape of the Army and the Interior Department is such that in case of emergency it will take an enormous amount of time to concert between them such measures as to secure the suppression of trouble. I see by the papers General Sherman has described before you the way it goes: How the Indian agent first reports in writing to the Commissioner of Indian Affairs, which takes several days; how the Commissioner of Indian Affairs writes a letter to the Secretary of the Interior, which takes several days; then the Secretary of the Interior writes and sends a letter to the Secretary of War, which takes several days, and the Secretary of War to the General of the Army, which takes several days; then the General of the Army writes a letter to the commander of the military division, which takes several days; then the commander of the military division writes a letter to the commander of the department, which takes several days, and that in that way about two months are consumed in red-tape transactions. Now, in the ordinary routine of business that may be correct, and that is what, I think, General Sherman intended to describe. But when prompt action is necessary we do not go through such lengthy forms. Whenever prompt action is necessary, the Commissioner receives a telegram from the Indian agent. With that dispatch in his hand he comes to me first, and shows it to me. If I think the case important enough to require the co-operation of the War Department, I get into my coach and go immediately to the War Department, and right to the Secretary of War.

If it is necessary to consult the General of the Army, that is done immediately, and we discuss on the spot what may be necessary to do. As soon as we agree, a dispatch is directed to be drawn up, it is read to us, and if we think that it is what is wanted, we approve it, and the whole process is gone through with in two hours. This red-tape business may apply to ordinary routine matters, but it certainly does not apply to cases of urgency. We have done things a dozen times in that way. I do not speak here of cases of Indian wars; but we acted thus when suddenly an escort was wanted, or an officer to be detailed for some special purpose, and so on. All this can and has been done in two hours, and if real trouble arises, and prompt co-operation of both departments is necessary, as a matter of course it would not take two months to get over the red tape, but action will always be had as quickly as I have described

I desire to call your attention now to the fact that the demand for the transfer of the Indian Bureau from the Interior to the War Department, or, to express it more generally, from the civil branch of the government to the military branch, is based upon assumptions and reasons which in a great measure, I think, are unfounded in fact. There is, for instance, the impression very industriously circulated that the civil administration of the Indian service has been responsible for all the Indian wars. They are currently represented to have originated in this way: Some Indian agent steals the supplies intended for the Indians, and the Indians get hungry, become dissatisfied, and go to war, and so on. When you go into the history of Indian wars you will find that this is not the fact. It is one of the myths made popular by frequent repetition, but which are without essence. If we want to ascertain the true inwardness of the real causes of Indian wars, we must inquire without prejudice into the history of every case; that is the way to find the truth.

The real cause of almost all our Indian wars was the breaking of treaty stipulations or encroachment upon the lands and upon the rights

of the Indians by the whites. In most cases the management of Indian affairs by agents, or even by the bureau, had scarcely anything to do with it. In some cases the whole government was responsible for Indian wars by initiating or consenting to measures which were incompatible with treaties and promises. In many other cases the white population living around the Indians and gradually overrunning them brought about conflicts. There were other causes to be mentioned later. Then, also, it must be remembered that the Indians are no angels, and in some instances there may have been Indian outrages which provoked retaliation on the part of the whites; and conflicts ensued in that way. When it is charged that the civil administration of Indian affairs has been responsible for the wars, the question may be fairly asked, Were there no wars under the military administration? Things past are very easily forgotten. Was the Seminole war brought about by the civil Indian Bureau? There was no civil control of Indian affairs at that time. It was under the War Department. The Seminole war lasted several years, and cost our government $50,000,000 and 1,500 men. The wars with the Sacs and Foxes occurred while the management of Indian affairs was under the military department. The troubles with the Creeks and Cherokees likewise. When the management of Indian affairs was turned over to the Interior Department in 1849, things suddenly assumed a new aspect. Then that great Western country, which before had been comparatively a solitude, was rapidly opened, and the Indians who until then had been freely roaming over the mountains and plains were suddenly interfered with.

The Indian question from that time presented complications never known before. The encroachments of the whites upon the Indians became infinitely more frequent on an immense extent of country, and with them increased the frequency of Indian wars. What caused those wars? Here is the first, the Sioux war of 1852–'54. Was that caused by Indian agents? You know the history of it. Some Mormons lost a cow; that cow was picked up by an Indian tribe, and they cut it up to eat it. A military officer with a small command of soldiers alighted upon them and demanded the cow. Of course the cow could not be given up, but the Indians offered compensation for it. The officer insisted that the man who had taken the cow should be given up. The Indians refused, the officer ordered his soldiers at once to fire into the Indians, and then ensued that war which lasted two years and cost over twenty millions of dollars. Was an Indian agent responsible for that? No; there was no Indian agent in the play at all. It was the rashness of a military officer that did it. Next the Navajo war. We have records of the origin of that also. An Indian shot a negro servant of a military officer. Then retaliatory measures were resorted to, and then the Navajo war. No Indian agent in the play. Then came the Cheyenne war of 1864. Ranchman Ripley reported that the Indians had stolen his stock, and Lieutenant Dunn pitched into the Indians at once. Then the Chivington massacre followed. The war cost us about forty millions of dollars. There was no Indian agent involved in that war. Then came the war of 1866, Colonel Miller took possession of the Powder Creek country. In that same report of the Sioux commission of 1868, signed by Generals Sherman. Terry, Augur, and others, you can find a full account of this Cheyenne war of 1866 and 1867, when the military burned a Cheyenne village on Pawnee Fork which cost us untold sums of money. Look into the report I have quoted and see whether you can find an Indian agent at the bottom of it. You will find causes very different.

The causes of the more recent wars, the Sioux war about the Black

Hills, the Modoc war of the Lava Beds, the Nez Percés war, are all alike in their origin. There were no Indian agents involved in them. Finally, the troubles with the Apaches, the Bannocks, and the Northern Cheyennes were just as little caused by Indian agents. So it will turn out that the principal wars had causes very different from those currently assigned to them. I am very far from denying that the Indian service under the civil management has furnished just cause of complaint; some of its abuses I have drawn to light myself; but when it is asserted that the Indian agents or the bureau have been the cause of the Indian wars, I say it is historically untrue, and that therefore the conclusions based upon that assertion are historically unfounded.

Let me quote another document which I find in the same volume with the report quoted before. It is a letter, written by Mr. Anson Dart, late superintendent of Indian affairs in Oregon, under date of November 28, 1868, addressed to the Commissioner of Indian Affairs:

> In 1850 I was solicited to take the office of superintendent of Indian affairs in Oregon, which then contained also Washington and Idaho Territories, in which there were about 25,000 Indians. I declined the office unless the military force in that country could first be removed. There were six military posts there. In 1851 the troops were all removed from Oregon to California. I had charge of Indian affairs on that coast for three years, and during that whole time there was no trouble with the Indians, and not one dollar was the government called upon to pay to quell any Indian disturbances during that time. But it was said that that peaceful state of things brought no money to Oregon, and "Dart must be removed and the troops come back." So in 1853 Dart was removed by President Pierce and the troops brought back. The troubles that followed you know. The wars of 1854 and 1855, in Oregon, I believe have cost the government more than $8,000,000. I am sure there was no good reason for having trouble with any of the Oregon Indians.
>
> I had a serious matter to settle, which grew out of the indiscretion of the officer in command of the last of the troops that were leaving Oregon. While passing the Rogue River country the officer was called upon to chastise the Indians in that neighborhood for some wrongs they were said to have committed. (Chastising Indians only means killing them.) Word came to me that the troops on their way to California had killed seventeen of the Rogue River Indians without any just cause. Upon a full investigation of that affair I found that the Indians were innocent of the charges laid against them. You can imagine that such an outrage was not easily settled.
>
> When I first went to Oregon no man ventured to go into the upper country east of the Cascade Mountains since the Cayuse war of 1848. I sent for the chiefs of the Cayuses to meet me at the Dalles of the Columbia. They refused to meet me until assured that I had no *blue coats* with me. So I have in all my travels in the Indian country found the Indians to dislike the military. Besides, I believe that 10 per cent. of the cost of the Army management of the Indians will pay every expense necessary to keep them quiet and friendly in every part of our Indian country.

It is said by military officers that they are naturally averse to Indian wars, that nobody desires peace more than they do, and so on. I think, as far as the superior military officers are concerned, that certainly is true. I am sure General Sherman and the higher officers of the Army have no desire for Indian wars. You will find in all military organizations the gentlemen who have risen to the top of the ladder, who have made their reputation as well as their position, scarcely ever desire more wars; but that does not always apply to the young officers who still have their way to distinction and advancement to make. They will not always control their impulse to resort to force before all peaceable means are exhausted by which conflicts might be avoided. Among the cases of Indian wars I have cited there are some strong and striking instances of a spirit in young officers to let the blow accompany the word, and to do something brave when it is not called for, thus precipitating conflicts. And here in the same report which is signed by General Sherman and other distinguished officers, there is one remark which is exceedingly

significant, and which you will permit me to read. After discussing the Indian wars of 1864 and 1866 and 1867, they say:

> Though this recital should prove tedious, it was thought necessary to guard the future against the errors of the past. We would not blunt the vigilance of military men in the Indian country, but we would warn them against the acts of the selfish and unprincipled, who need to be watched as well as the Indian. The origin and progress of this war are repeated in nearly all Indian wars. The history of one will suffice for many.

Thus it appears that these eminent generals thought it proper that military officers be warned against rash doings, which might bring on conflicts precipitately. But if military officers do not want Indian wars, can you see why an Indian agent should desire any difficulty with his Indians? Surely the Indian agent might be the first man liable to be scalped, and therefore he has reason to be peaceably disposed. While it may be taken for granted that the higher military officers can have no desire to involve us in conflicts with the Indians, there are, as I have shown, several instances on record where the precipitate action of younger officers led to grave and expensive troubles which otherwise might have been avoided.

By Mr. McCREERY:

Q. How many Indian agents have been scalped?—A. No Indian agents have been scalped for the reason I stated, that no Indian wars have broken out in that way, as generally charged. Going over the history of Indian wars I have shown that the impression which has been generally and industriously circulated that such is the cause of Indian wars is historically unfounded. But let me repeat that I do not mean to intimate in any way that the Indian service, as it has been administered, was a perfect service. I do not deny that a great many things have been done which were highly censurable, but the consequences and result of which were not as have been stated.

The second point which is urged, especially in the newspapers, and with much effect, is that the business methods in conducting the Indian service, as carried out by the War Department, were very far superior in point of system, honesty, and economy to those of the civil administration. There, also, is one of those myths which seem to have been originated in a forgetfulness of the past. I may say it is an exceedingly ungrateful and unpleasant task to me to institute any comparison between different branches of the public service, and I certainly would never think of doing so had not the issue been forced upon us. Being at the head of the civil department, I have to protect its honor as far as it deserves it. I do not wish to be misunderstood. In my department it is an invariable rule when an officer is discovered in wrongful practices to prosecute him with the utmost severity. But as long as I have reason to think an officer innocent and honest, and as long as he performs his duty with efficiency, that officer has a right to look up to me for the protection of his honor, and in every case he shall have it. I say the issue was forced upon us, and I am obliged to take it up. I have read in the newspapers a statement made to this committee by General Marcy to the effect that when the management of the Indian service was under the Army everything went smoothly; that there was never an act of dishonesty or mismanagement; that, in fact, there was no suspicion of anything wrong. Without desiring to speak ironically, it might be inferred from the statement of General Marcy that it was as if angels had descended upon earth to administer gently to the wants of the savages to lead them to a higher state of being. That is another myth which has become popular from forgetfulness of the past. Here, again,

people reason upon assumptions not founded in fact. I have brought some official documents with me to show what the business management of the Army in conducting Indian affairs really was. The truth of history ought to be well considered in connection with the question of the transfer. Having brought the documents themselves so that you can refer to these, I speak by the book. Here is the report of a committee of the House of Representatives in 1842, which expresses itself about the business methods in the conduct of Indian affairs under the War Department in this wise:

[Twenty-seventh Congress, second session, House Reports of Committees, vol. 4, 1841, 42.]

Extract from Report No. 741, pages 25 and 26.

The accounts of the Indian funds have imposed very little labor indeed on the clerks here, as the evidence will show that they have been kept with unpardonable negligence.

With regard to the number and character of the agents employed at a distance, in connection with Indian affairs, the committee are satisfied there could be considerable reduction, and that it would be attended with beneficial results to the Indian tribes as well as the Treasury. The multiplication of these offices under treaties, and under laws, and under regulations, seems to have been designed more for the convenience of the white man than the benefit of the Indian. The evidence is submitted as to the general management and present condition of Indian affairs, and it requires little comment. It exhibits an almost total want of method and punctuality, equally unjust and injurious to the government and to the tribes to whom we have voluntarily assumed obligations which we are not at liberty to disregard. It will be seen that the accounts of millions of expenditures have been so loosely kept as scarcely to furnish any trace or explanation of very large sums, and that others have been misapplied, so as to impose serious losses on the Indians and heavy responsibilities on the government; that in some books (the only record kept of these accounts) no entries have been made for a period of several years, and that where entries had been made they are so imperfect that the very clerks who kept them could not state an account from them. The whole system of accounts in this department requires revision and radical reform. There has been great prodigality as to funds which should have been invested for the Indians; and the investments actually made have been in stocks of States, purchased in some instances above par, and now paid out by the government, as trustee, at par, while they are worth only 25 and 30 cents on the dollar. The accounts in the Indian Bureau and in the Second Auditor's Office are very imperfect, and are so kept as to facilitate the practice of irregularities with impunity. No separate accounts are kept of the Indian business, except as to the Chickasaws, and these only show the aggregate of requisitions and disbursements. Indeed, the books of the accounting officers generally seem very deficient, only exhibiting, in several instances, entries of appropriations and disbursements in the aggregate, and these are sometimes carried out only in pencil-marks, and with loose marginal memoranda. The committee forbear to animadvert on the facts disclosed by the evidence as to this bureau.

It is a matter of fact that in the Indian Office there is not a single bound volume of records, referring to the land interests of the Indians, that has come from the War Department to the Interior Department. Without going into particulars I think it will be unnecessary to point out how important the land interests of the Indians are, how much more important they are gradually becoming as the Indian has got settled.

All that has come from the War Department to the Interior Department in connection with this important subject consists of a mass of letters, memoranda, scraps of paper with pencil-notes, and so on, and that is the land record of many years.

I wish to call attention to another subject, and again I speak by the book and wish to continue to do so.

Here is a report from Lieutenant-Colonel Hitchcock referring to the care taken by the Army of Indian supplies. When it became public the House of Representatives asked for an investigation of the matter. The Secretary of War at once refused it until it was forced upon him.

In that report, which attained at that time a certain celebrity, the following occurs:

[Twenty-seventh Congress, third session, House Reports of Committees, vol. 3, 1842–'43.]

Extract from Report No. 271, page 29.

At one period an immense quantity of provisions, mostly pork, bacon, and flour, was purchased by order of the Indian Bureau, and thrown into the country west of the Arkansas at the cost of several hundred thousand dollars, originally designed, as appears by the correspondence on file in the Indian Bureau, for various tribes; but the plan of issue being dispensed with, and the system of feeding the Indians by contract having been resorted to, the provisions seem to have been charged to the Cherokee fund and the bulk of it accounted for by sales and by a transfer to certain contractors for furnishing provision to Creeks and other Indians.

One of the letters on file in the Indian Office, in reference to those provisions, is from James Glasgow, for Glasgow & Harrison, dated at Saint Louis, November 30, 1837, addressed to C. A. Harris, esq., Commissioner of Indian Affairs, and purports to be a proposal to take the provision above referred to, on certain conditions, which are stated:

"Of the pork, we will take all that is sound and in good order. The flour, we are aware, is all sour; but we will take all of that which has not been damaged by wet. The bacon, we will take all that is not damaged."

For the provisions thus taken, the contractors, according to their proposition, expected to make a contract for issuing provisions to Creeks, Seminoles, and other Indians, at twelve and a half cents per ration, provided the issues were made at the depots where they expected to receive the provision above designated, but if required to issue it at other points, they were to be allowed an advance not specified.

Upon another sheet of paper, annexed to this letter, and in the same handwriting, is another proposal in the following words:

"We would make a further proposition, that would, should [*verbatim et literatim*] a much less loss in the disposal of the supplies referred to in our other letter, viz:

"Ration the Indians as aforesaid at 18¾ per ration and add 50 per cent. on the price of the provisions; which would make pork $9.75, flour, $3, bacon, 4½ cents.

If you wish any additional information respecting our standing I would beg leave to refer you to our friend Col. A. H. Sevier.

"Respectfully, your obedient servant,

"GLASGOW & HARRISON."

It will readily occur to you that this simple mode of diminishing the loss on the provision, under the orders of the Indian Bureau, might easily have prevented altogether a *loss* on that provision, but with the inconvenience of paying that loss out of the Treasury of the United States by an advance upon the contract proposed by Glasgow & Harrison.

When you go through this report, which I will not read at length, you will find charges of Indian mismanagement as to contracts, charges as to the care that is taken of supplies worth hundreds of thousands of dollars, charges of looseness in the conduct of business generally, in considerable number. It will be instructive reading.

As to the matter of official carefulness and business principle in the management of the Indian service when under the War Department, I suppose there are some persons who have a recollection of the removal of the Cherokees.

By the treaty of 1835, the Cherokee Indians ceded to the United States all their lands east of the Mississippi, in exchange for which they were given their present territory and five million dollars, aside from certain other sums guaranteed to them.

In the fourth article of said treaty the United States agreed to expend fifteen thousand dollars in extinguishment of the title of certain Osages within the limits of the lands granted to the Cherokees, and also to pay for improvements made on the Harmony and Union Missionary Reservations (7th Stats, 481). By the fifth article of the supplementary treaty of 1846 (7th Stats, 489), the United States agreed to pay the expenses attending the negotiation of the treaty and supplement.

These treaties were negotiated by the War Department. A sample of the evasion of treaty obligations may be found in the statement of the account between the government and the Cherokees, wherein the three items above named, amounting in the aggregate to $77,080.97, were charged up against the Cherokees and deducted from their funds. (See Ex. Doc. 65, 1st sess. 30th Cong., vol. 8, No. 399.) The same document discloses the fact that a discrepancy of $145,122.78 existed in the funds of the Cherokees, $76,976.54 of which arose *from the defalcation of two persons at the time officers of the Army.*

It appears from House Report 1098, page 15, vol. 5, 2d session 27th Congress, No. 279, that J. C. Watson & Co. had offered to remove the Cherokees from North Carolina, Georgia, and Tennessee to the Indian Territory for $32 per head. This offer was not accepted, but (as it is shown by the record of contracts in the Indian Office) contracts were let at about $40 per head to other parties. These contracts were afterward canceled and a new contract let for the removal of the Indians at $65.88 per head.

On account of the supersedure of the contracts damages were allowed to Clements, Bryan & Co. to the amount of $31,302.10; to Williamson Smith to the amount of $51,700.42; and to Sangtry & Jenkins for supersedure of contract for shoes, $144,365. (Ex. Doc. No. 65, page 20.)

A contract was made at $10 per head, and 2,000 Cherokees removal thereunder. (Ex. Doc. 1098, page 22.)

Transportation was allowed and paid for 1,633 persons in excess of the actual number removed, costing in the aggregate $204,276.98 (Ex. Doc. 1098, pp. 10, 11), and the actual per-capita cost of removal was $103.25. (*Ib.*, page 15.)

The allegations contained in Doc. 65 embrace a portion of the report of Secretary of War William L. Marcy, transmitted to Congress with the President's message of May 20, 1847, being the report of William Medill, Commissioner of Indian Affairs, and those of Doc. 1098 from a report of Secretary of War J. R. Poinsett:

[Thirtieth Congress, first session. House Executive Documents, Vol. 8, 1847–'48.]

Extract from Document No. 65, page 20.

Expense of negotiating treaty of 1835–'36 and supplement, and of delegation of Cherokees to Washington, who signed the latter	$37,080 97
Extinguishment of title to Osage reservations in country west	15,000 00
Improvement on Union and Harmony missionary reservations	25,000 00
Extra compensation to General Scott for his services in connection with Cherokee removal	1,952 00
Amount allowed Clements, Bryan & Co., under special act of Congress for their relief, for damages on account of their contract for subsisting emigrating Cherokees, having been superseded by the arrangement made by General Scott with John Ross and others	31,302 10
Amount allowed by Treasury Department to Williamson Smith as damages, under contract for removal of Cherokees, which was superseded in the same way	51,700 42
Amount allowed by special act of Congress to Langtry & Jenkins for damages arising out of supersedure, in same way, of their contract for furnishing emigrant Cherokees with shoes	144,365 00

Page 21:

This discrepancy arises from the deduction of the amounts for certain objects improperly charged to the funds under the treaty, and which, as stated, the United States have to make good from the defalcation of two persons, at the time officers of the Army, acting as disbursing agents of the Indian Department, amounting to $76,976.54, and from moneys in the hands of a former agent for the Cherokees, whose accounts have not yet been finally settled.

It appears, among other things, that each Cherokee had six pairs of shoes, paid for at $2 a pair.

Among all the charges which have been brought against the civil management of Indian affairs, I think it will be very difficult for you to find a single case as glaring as this. I repeat again that I do not want, oy any means, to whitewash the civil management as to purity, but certainly the Indian service received its bad name first under the War Department management of it, and not under the civil administration, and the cry for the transfer from the War Department to the Interior Department was, at that time, stronger than the cry is now for the transfer back; and it is my honest conviction that, at that time, the condition of the Indian service, under the War Department, called much more for a change than it does at present.

There is another item to which I want to call your attention, as it was characteristic of the management of Indian affairs under the Army; it is the trade with the Indians. The report of the committee of the House of Representatives, in the year 1834, throws some light upon this subject. The report says:

[23d Congress, first session. House Reports of Committees, Vol. 4, 1833-'34.]

Extract from Report No. 474, page 1.

Yet, so manifestly defective and inadequate is our present system, that an immediate revision seems to be imperiously demanded.

Pages 96, 97:

Who would have supposed that on the borders of the navigable waters of the Missouri, no farther west than Fort Leavenworth, guns, which cost in Saint Louis $7, are sold for $30? Squaw axes, which cost 37½ cents, sold at $2? A double handfull of salt, which cost 62 cents per bushel, sold at $1? Five and six gallon kettles, costing 25 cents per pound, sold at $12? (See document marked F.)

Who would have supposed that, on the navigable waters of the Upper Missouri, the Indians would be compelled to pay the following prices?

	Cost in Saint Louis.	Sold at.
For a yard of strouding, costing, per yard	$1 80	$8 00
One 3-point Mackinac blanket	4 00	12 00
One 2½-point Mackinac blanket	3 00	10 00
American calico, per yard	16	1 00
English calico, per yard	22	1 50
Indian guns, per piece	7 50	25 00
Gunpowder, per pound	30	1 50
Tobacco, per pound	7	1 00
Hoes, per piece	40	2 50
Vermilion, per pound	1 50	7 50
Whisky, per gallon	25	16 00
Blue strouding, per yard	80	3 buffalo-robes.*
White beads, per pound	35	3 00
Tobacco, per pound	5	1 00

Many other articles are specified in the schedules referred to, marked E, F, G.

There is no reason to doubt the fact that one company has now in operation an extensive distillery of ardent spirits at the mouth of the Yellowstone River, where, it is said, alcohol reduced to proof is exchanged with Indians at $64 per gallon, and, when carried to the interior, at a much higher price.

By the CHAIRMAN:

Q. What is the date of that?—A. It is a report made in 1834, the Twenty-third Congress, first session. From all this it appears that the record of the War Department management of Indian affairs is by no means as angelic and clean as General Marcy the other day represented it. The people of the United States may be inclined to forget the past, but when the transfer of a very important branch of the public service from one department to another is contemplated, and that, too, upon the ground that one was correct and pure in its business methods, while

* Buffalo-robes are worth $3 to $3.50 cash. (See document G.)

the other was the reverse, then historical inquiry is not only legitimate but necessary. The first time the Indian Office got a bad name was not under the Interior but under the War Department, and everybody conversant with the history of the times will bear me out in what I say.

You ask me if the Indian business has been honestly and perfectly conducted since it was put under civil administration. I do not pretend to any such thing. I think a great many scandals have occurred, although none quite as bad as the Cherokee removal. Considering that the Indian service has, since 1849, spread over a vastly greater extent of country, and that we have to deal with Indians thousands of miles away from the seat of government, is it not strange that here and there bad practices have sprung up; but this was not essentially owing to civil administration, since, as I have shown, such things did, in a great measure, occur under military management. As to the shortcomings of the Indian service under the civil administration, without being boastful, I may say that during my own administration of the Interior Department, more has been done to draw abuses to light and to expose them without fear, for the purpose of correction, than before. I appointed a commission with the distinct instruction to go to the very bottom in their investigation of the Indian service, and whenever a rotten spot was found to point it out, so that the remedy might be applied. You have my report. These things having been done by my own order, I cannot be charged with making an attempt to whitewash the Indian service as it is carried on under the Interior Department. You may ask me the question whether I believe the Indian service can be made honest. From my experience in the Interior Department, I do not hesitate to say I do believe the Indian service under civil administration can be made as honest as any other branch of the public service. There are two essential things required to accomplish it: Energy and fearlessness at the head of the department, and, in the second place, a sufficient force to carry on the necessary inspections. With these two things, in spite of all inherent difficulties, I do think the Indian service can be made as honest under the civil administration as any other branch of the government. Of course it cannot be done in a day, for it requires time to discover abuses, and it may require some time to invent methods for their correction; but I have no doubt it can be done. I think we have already made great progress in that direction. We have introduced important improvements in the business methods of the Indian service, calculated to prevent many of the abuses which formerly occurred, and speedily to detect those which may still occur. I feel warranted in saying that, except the whisky-ring prosecutions under the Treasury Department of a few years ago, no department of the government has been more active in prosecuting those connected with it who were detected in wrong-doing. We have at present some fifteen or twenty indictments pending. Only a couple of weeks ago a contractor, I suppose for the first time in the history of the Indian service, was not only indicted, but found guilty by a frontier jury, and is now in jail. A number of former Indian agents, employés at Indian agencies, and contractors have been indicted, and are now awaiting their trial.

By Mr. McCREERY:

Q. You do not go into those particulars in your report?—A. No, sir; I did not go into those details in my annual report for the reason that I did not want to produce there the names of persons merely indicted. I thought it fair to them to wait for their trial before officially mentioning their cases.

With reference to business management I do contend, and I think you, gentlemen, can convince yourselves by going to the Interior Department to inquire into things yourselves, that our business methods are infinitely superior to those under the War Department management of Indian affairs. There are some things which it would be very difficult, under any circumstances, and employing the best men, to administer under the War Department. I have already called your attention, to illustrate this point, to the administration of the land interests of the Indians, which is in every respect a civil affair, and it is not strange that under the War Department it should have been neglected as it was. I certainly do not pretend, and I should be very slow to assert, that an Army officer, as such, has any dishonest tendencies in his character. I think the Army deserves as a whole its reputation for integrity. Yet it would, at the same time, be absurd to say that there is a class of men who are inaccessible to the lower impulses of human nature, as the record of defalcations and similar things proves. Nor need I tell you that just as bad in its effects as a lack of integrity is sometimes a lack of aptitude for correct business methods.

Speaking on the condition of Indian affairs at present, you may perhaps have noticed the correspondence which passed between the War Department and myself with regard to certain allegations recently made by General Sheridan. You will have noticed also that my language in demanding of General Sheridan specifications to the charges made was particularly pointed and sharp; and I desire here to say that I used that language for the purpose of provoking him to state the very worst he knows. If he does know anything about the Indian service he did not state before, I hope he will do so now, so that we may correct it.

Now upon the point of economy. I saw in the papers a statement made by General Marcy here, that under the administration of the War Department the Indian service cost eight hundred thousand dollars, while under the administration of the Interior Department it cost five millions, which, as he said, made a difference of four million two hundred thousand dollars in favor of the War Department. Gentlemen, it will occur to every one of you at once that such a comparison is unwarranted. The administration of Indian affairs was turned over to the Interior Department in 1849. The Indian business was nothing before 1849 compared with what it is now. At that time it was confined to a narrow compass on the Indian frontier; now it is spread all over the country. Under the management of the War Department the number of Indians taken care of by the government was insignificant, and now there are nearly two hundred thousand. You might as well compare the cost of the administration of the general government under President Jefferson with what it costs now under circumstances so essentially different, and upon the ground of such comparison charge the present administration with extreme extravagance.

Certainly the Indian service has grown as much in proportion from what it was before 1849 as has the government of the United States from what it was under the early Presidents.

What do you expect to save by turning the Indian Bureau over to the War Department? You say you will save the salaries of the Indian agents. There are, at the present moment, seventy-four of them. Some of the agencies are in process of consolidation, and when that is accomplished there will be a smaller number. That saving might amount to something like a hundred and twenty thousand dollars. But, mark you, if you intend to carry on any civilizing process at all, to set to work and instruct and educate the Indian, you will have to employ the other civil

employés on the agencies just as at present. Then you will save just the salaries of the agents and nothing more. The rest will remain as it is at present, with the risk that other savings we now make will not be made by the War Department, which, in my opinion, will amount to much more.

I have a paper here which was put into my hands by an officer of the Indian Bureau who looked up the contracts of both departments and made a comparison between them. There I find this, that in the article of beef, contracts were made for the Indians on reservations close by military posts. Beef was taken, in many instances, by the Indian service and by the military from the same contractor and from the same herd, being in quality virtually the same beef. The table I here submit shows what was paid for beef by the Indian Bureau and by the military, respectively, in the same localities:

Prices of beef at Indian agencies and adjacent military posts.

Indian agencies.	Per 100 lbs. gross.	Military posts.	Per 100 lbs. gross.
Cheyenne and Arapahoe	$2 69½	Fort Reno	$3 50
Kiowa and Comanche	2 69½	Fort Sill	3 00
Cheyenne River	2 87$\frac{43}{50}$	Fort Sully (9.04\frac{8}{10}$)	4 52$\frac{8}{20}$
Fort Berthold	2 90	Fort Stevenson	3 62
Red Cloud	2 33	Camp Robinson ($8 net)	4 00
Standing Rock	2 87$\frac{43}{50}$	Standing Rock military post	4 75
Yankton	3 45	Fort Randall	4 50
Blackfeet	1 95	Fort Shaw	2 62½
Fort Hall	2 20	Fort Hall ($10.50 net)	5 25
Mescalero Apache	2 18¾	Fort Stanton ($6 net)	3 00
Average at Indian agencies	2 47	Average at military posts	3 87

By a comparison of the contract prices for beef cattle to be delivered at the Indian agencies and military posts named in the accompanying schedule (which agencies and posts are located in the vicinity of each other), it will be learned that the difference between the average prices to be paid by the Indian Bureau and the War Department is about $1.40 per hundred pounds in favor of the Indian Bureau.

The bureau receives annually, under contracts, some 46,000,000 pounds of beef, gross weight. At $1.40 per hundred pounds there would be a difference in the cost of the single article of beef of $644,000.

This sum is more than enough to pay the salaries of all the employés connected with the bureau.

I repeat, I am far from charging the War Department with dishonesty in this thing. On the contrary, I am convinced that these things were honestly done. But, gentlemen, it is no news to you that the army, in every country and in every age, always has been and is a very expensive institution, lavish in its oulay. The officers of the Army are the cavaliers of the country. In their doings, they trouble themselves less than we do about money, and also about government money. When they want a thing done, it is apt to be indifferent to them what that thing costs. One of the highest military officers said to me once, "When I deem a thing necessary, it does not matter to me whether it costs one million or five." We civilians are inclined to lay particular stress upon economy in every point. In our purchases, it is invariably our aim, first, to get a good article, and, in the second place, to get it cheap.

I understand there was a statement made here the other day by General Meigs that the transportation of the Army cost four millions. Now, the transportation of the Indian service cost two hundred and nineteen thousand dollars last year, and may cost this year two hundred and twenty-five thousand dollars, in round numbers. The number of tons of freight transported by the two branches of the service is, as I understand,

nearly the same. It may be said that the Army has a larger field to cover, though not much larger. They transport food, clothing, and sometimes ammunition, and sometimes soldiers, which of course increases the cost of their transportation. The difference between the sums expended by the Army and the Indian service for transportation is so enormous you may well inquire how it happens that while the Indian service, transporting supplies and a variety of goods over a vast extent of country up to the utmost confines of Washington Territory, expends only two hundred and twenty-five thousand dollars, the Army uses four million dollars for transportation alone; in fact, as much as all our Indian supplies and goods cost, inclusive of transportation to the points of delivery. Such an inquiry will, I think, convince you that we get our transportation at cheaper rates than the Army. I will make no positive assertion, but you may find it worth inquiring into. Sometimes, in the course of the examination of reports, we find things cropping out calculated to illustrate the cavalier-like manner of dealing with money by the Army officers.

In the correspondence between the War Department and myself concerning General Sheridan's statements in relation to the consolidation of Kiowa, Comanche, and Wichita Agencies, there was some mention of the agency buildings, which had been constructed by the military at a cost of $17,000, turned over to the Indian service a year after, which had at once to be propped up to keep them from falling down. If the Interior Department had put up buildings at a cost of such a sum of money that had to be kept from failing down by props a year after their erection, and in which the stores inside had to be covered to protect them from the rain, there would have been an outcry about Indian mismanagement. The other day, in running over some reports of last year, I found a similar instance of economy. At the close of the Sioux war, at the Cheyenne River Agency, about two thousand two hundred horses, ponies, and mules were taken from the Indians by the military to be sold, and the Indians were to have cows for them. For the two thousand two hundred horses and mules sold by the military the Indians got four hundred and fifty cows, and in the account rendered it turned out that the two thousand two hundred horses and mules had been sold for $19,412.96, and that the expense of selling them was $5,683. This expense seemed rather heavy. I am far from charging any dishonesty in this transaction, but it illustrates the cavalier way of doing things, regardless of expense, occurring in the Army. In a civil department it would scarcely have passed without severe censure. At Standing Rock the Indians got, for two thousand ponies, three hundred cows from the military, while this year we sold two hundred and forty-eignt ponies for $4,700; not as the military did in the instance first mentioned, at the rate of eight or nine dollars, but at the rate of $19 per head. The latter case shows what can be done. This sale, I think, was also made by a military officer, but under the direction of the Interior Department. This would seem to show some difference between the cavalier and the civil ways of doing things. Without desiring to make invidious comparisons, I repeat the expression of my wish that you would examine in the Interior Department our business methods, to see what care is taken in the expenditure of money as well as the examination of accounts.

The suggestion has been made by General Marcy and other Army men that the transfer would enable the employment of the retired officers of the Army at the agencies. Let me say that if military men are to be used, the employment of vigorous, active officers should be exclusively resorted to, if the service is to remain in any way efficient. And

I may add that we have had some military officers detailed for special purposes in the Indian service by the War Department to whom we are obliged for the efficiency, assiduity, and fidelity with which they performed the duties assigned to them. But the employment of vigorous, active officers at the agencies would be one thing; the employment of the retired list is another. Men who have learned to love their ease do not, as I think, possess the requisites of efficiency in the Indian service, as I understand General Crook has already told you, and those who mean well with the Indians, I think, will confirm this opinion.

In one respect I think the Army management particularly less economical than the civil, and that is the essential point. I am convinced that Army management is in its nature calculated not to promote but to retard the civilization of the Indians. But the gradual civilization of the Indians—setting them to work, educating their children to industrious habits—is to be looked upon in the long run as the principal and most efficient measure of economy, as it will in the course of time relieve the government of those burdens which now are rather heavy. I cannot impress it upon you too strongly, if you want a practical economy, if you want to get rid of the necessity of paying large sums of money for the Indians, there is but one way, and that is to make the Indians self-supporting by giving them every possible encouragement in the ways of civilized life. That is the best and surest method, and there is no other.

But we should also look at the desires of the Indians themselves with regard to this transfer question, and I understand the Commissioner of Indian Affairs has sent a record of opinions expressed by the Indians about it. In that record you will find that the Indians themselves very generally are not only not in favor of the transfer of the management of the Indian business from the Interior to the War Department, but very strongly opposed to it; and when you read their opinions as expressed by them you will find that there are certain instincts, sentiments, and fears running through them all. One is that under civil administration they will be more actively and more efficiently led into the ways of civilized life; and the second is that the contact with the Army, as a general thing, appears to them demoralizing in a certain sense. A third is that their condition will be still more unsettled and restless. So, if you consult the opinions and desires of the Indians themselves, I do not think you will come to the conclusion that it will be best to make the transfer. And, in my opinion, it is of great importance that we should consult the wishes of the Indians themselves in a matter of such consequence to them. It is natural that in a contented state of mind the Indians will be most peaceably disposed and most accessible to civilized influences; while, on the other hand, if we bring them under relations which they themselves dislike and which are calculated to make them still more restless, we shall only increase the difficulties we have to contend with in the civilizing work.

Let me call your attention to another point. Almost all the treaties made with Indians in the last 20 years have been distinctly pointing to civil administration. Some of the most important provisions in those treaties provide for the means by which they are to be civilized—for schools, for the distribution of agricultural implements and cattle, for the appointment of farmers, the promotion of agricultural pursuits, and so on—in one word, for civil and not military work.

But, gentlemen, do not forget that the real difficulties of the Indian problem are not touched by any transfer of Indian management from one department to another at all. The real difficulty consists in the fact that the Indians are scattered over a vast extent of country, where the

whites are recklessly and mercilessly pushing and jostling them in every direction to get their lands, so that when the poor red men, under good guidance, make an effort at self-improvement and progress in self-support, their greedy neighbors undo it all by crowding upon them and driving them from place to place.

You may put the Indian service under any department you please, but that source of trouble will remain the same, and no department of the government can remedy it unless we adopt and carry out a general policy—the policy frequently proposed, of putting them upon reservations where they can be protected and find permanent homes without being disturbed by the progress of white settlements. If you think by merely changing the control of the Indian service under this or the other department of the government you can solve the problem, you will finally become aware that you have only trifled with this grave question. The real difficulty will have to be grappled with and solved in the way of general policy under whatever department of the government the Indians may be.

In conclusion of my general remarks on this subject, I may say that in my opinion there are some reasons why the Indian service might be constituted as an independent department of the government; but that is a large question, for it would involve the policy of increasing the number of members of the Cabinet, which is rather farther reaching than the matter under discussion. I do not think it would be good policy to make the Indian Office independent in the same manner as the Agricultural Department is now. Whether you resolve upon a change or not, you must have for the Indian Office, directly, or, as now, indirectly, a head who is clothed with the same dignity of official station, and with the same responsibility before the country and Congress, as other Cabinet ministers. I think if the Indian service could be raised to that level it might be for its own interest a good thing. But I repeat, I do not think you will gain anything by the transfer to the War Department; on the contrary, I am convinced you will lose much.

There are certain practical recommendations I might make the adoption of which, I think, would obviate some of the difficulties we have to contend with. First, if the Indian service is left where it is now, or if it be made a separate civil department of the government, it would, in my opinion, be advisable to authorize the President by law, whenever in his judgment it may seem desirable or necessary, to place such reservations or Indian tribes and their surroundings as may be involved in trouble, or threatening to become involved in trouble, under control of the Army for purely military purposes; and if it could be done consistently with our constitutional principles, I would go so far as to say it would be desirable to authorize the President, whenever in his judgment he deemed it necessary, to place such reservations under martial law, including a circuit of several miles around them, so as to put not only the Indians but also their nearest white neighbors under military jurisdiction for the emergency. This would, of course, apply only to exceptional cases.

Second. It seems to me advisable that the President be authorized to designate such officers of the Army as he may deem fit for employment in the Indian service, under the direction of the civil department. As I said before, there are undoubtedly some military officers who could temporarily render excellent service in that way, especially so as to increase the inspecting force we have now. Last year I recommended in my annual report that the inspecting force of the Indian service be increased, for the simple reason that at present that force is entirely insufficient for

its purposes. Even with the greatest exertion it can do only a part of what ought to be done. Every agency ought to be visited at least once a year by an inspector for a thorough inquiry into its affairs, which is now impossible. It would be very desirable, and contribute much to the efficiency of the service, to have every agency so visited twice a year. Of course, we cannot do anything like that with three inspectors. If Congress were willing to give us seven or eight, a number we could very well employ, it would, in my opinion, be one of the most economical of measures. If Congress cannot be induced to do that, it may be well to authorize the President to assign such military officers to such employment in the Indian service as he sees fit.

The third measure I would recommend, and which I consider of very great importance, is an increase of the police force of the Indians. We have organized an Indian police now on twenty-two agencies, and from all reports we receive this force is exceedingly effective. Whenever an Indian is thus officially employed with some marks of distinction and government pay, as we find by our own experience, and as I am informed by persons long acquainted with the Indian service, that Indian is always reliable and faithful in the discharge of his duties. I think if instead of 450 we were authorized to appoint about a thousand or twelve hundred Indian policemen so as to cover all agencies, employing more at one agency and less at another as they may be needed, we could relieve the military of a great part of their work and trouble, and do it at small expense.

The fourth thing necessary is that the appropriations made by Congress for the support of the Indians should be not only ample, but made early in the year, so as to enable us to carry out the treaty requirements promptly. A great embarrassment we have frequently to contend with, arises when appropriations are made as late as last year, there being, in such a case, as I might express it, a dead angle between the time when the stores of the preceding year are exhausted and the time when in the process of regular advertisement, opening of bids, and awarding of contracts, &c., new stores can be bought and delivered to the Indians. It is at such times that the rations may run short, causing dissatisfaction among the Indians.

The fifth thing I consider important, is the appropriation of what I might call an emergency fund, to be so placed at the disposal of the Secretary of the Interior, or of the President of the United States, as to be used with proper accountability in cases of unforeseen need, such as, for instance, preceded the Bannock trouble.

This closes my general remarks. If there are any questions which gentlemen wish to propound, I will be glad to answer them.

By Mr. HOOKER:

Q. In the remarks which you have made in reference to the management of the Indians, did you draw a distinction in your mind with regard to the five civilized tribes in the Indian Territory, and the remainder of the Indians?—A. I do not understand you.

Q. In reference to the management of the Indians, whether under the one or the other department, did you draw a distinction between the five civilized tribes of the Indian Territory and the rest of the Indians?—A. You mean with regard to their treatment?

Q. Yes, sir.—A. I would say the civilized tribes, to a great extent, can take care of themselves, and in the course of time we can be relieved from making any appropriations by the department. Those tribes that are not civilized must be made so, and the policy of the government

should be especially so directed as to advance them in that respect. I would not advise, except in case of trouble, or apparent trouble, the turning over of any tribes to the War Department. As a general thing, the normal condition of the Indian is peace, not war. To be sure we have had outbreaks for years, but they are local, and the large mass of the Indians are even then peaceable. I would not advise turning over any of them to the War Department except in case of actual or clearly threatened trouble.

Q. Is there in point of fact any agent at present among the semi-civilized tribes of the Indian Territory?—A. We used to have the Union Agency there, but it has been abolished.

Q. Then there is no agency there now?—A. No, sir; not at present. They are taking care of themselves wherever civilized and we can relieve them.

Q. In point of fact, the Interior Department looks upon the condition of those five civilized tribes as satisfactory as to intelligence and capacity to take care of their own affairs?—A. I do not remember whether the agency of the five tribes was done away with upon the recommendation of the Interior Department or by action of Congress.

Commissioner HAYT. By action of Congress.

Mr. SCHURZ. Those tribes are undoubtedly doing well. I think there are other tribes which might soon be relieved of the supervision of the Interior Department. I do not see any good reason for an agent, for instance, in New York State except to pay their annuities.

Q. The amount which is paid to these five tribes is paid under treaty stipulations with the government—their annuities, I mean, are paid under treaty stipulations? I would like to know what proportion of the savage Indians, as they are termed, we have treaty stipulations with who receive annuities. The object of my inquiry is to ascertain what proportion of the savage tribes is supported by the government outside of treaty stipulations.—A. I cannot from memory give you a clear statement of that. We have treaty stipulations with a great many savage tribes—such as the Sioux, Cheyennes, Arapahoes, Kiowas, Comanches, &c. There are some with whom we have no treaty stipulations.

Q. They are mostly small tribes?—A. Mostly small tribes.

Q. With the larger tribes we have treaty stipulations, and the annuities due them are due under treaty stipulations. You were speaking of the statement made by General Marcy, in which you spoke of its being improper to compare the cost of the management of the Indian Bureau at that time to which you referred, when he said its expenses were $800,000, and the cost of the management of the Indian Bureau now, when it is $5,000,000—that it was improper to make a comparison of the cost of management because of the changed condition of affairs. Would not the same remark apply to the comparison which you have made in regard to the management of Indian affairs in 1834 under the War Department and now?—A. In what respect?

Q. In respect to their changed condition.—A. The statement was simply this: that since the Indian service was turned over to the Indian Bureau the field of operations has been very much enlarged; that at that time the whole Western country west of the Missouri River was hardly opened, and that for the first time after the change we came in contact with many of the Indian tribes; that a great many of those tribes are now settled upon reservations, and that therefore the cost is now much larger than it was at the time with which the comparison was introduced.

Q. In reference to the other portion of the Indian tribes, outside of the

civilized tribes of the Indian Territory, the government in point of fact maintains a military post, does it not, at or in the vicinity of all the agencies?—A. I would not say at all of the agencies by any means. There are a good many which have no military posts.

Q. But at a large majority of the Indian agencies they do maintain military posts?—A. I think at most of them in the Western country they do.

Q. You referred to the method in which troops were called upon to interfere in the event of a disturbance arising among the Indians from any cause whatever. What is the ordinary method in which troops are called upon?—A. I think the report of the Commissioner of Indian Affairs on the origin and progress of the Bannock trouble will give you an idea of the manner in which such things are sometimes done.

Q. I observe that the correspondence began on November 27, 1877, and that it terminated, according to the correspondence embraced in the report of the Commissioner of Indian Affairs, in March, 1878, or thereabouts. Is it the custom, when a disturbance occurs among the Indians, for the Indian agent to call upon the officer at the post, or to the Indian Bureau and through the Indian Bureau to your department?—A. I think when the Indian agent is himself much pressed, and is a man of sense, and he has soldiers in the neighborhood, he will at once advise the officer at the fort. If the officer at the fort can help him he will do so. If he thinks he cannot help without applying to the department he will do that. I suppose, in this case, if the agent did not apply (I think he did not apply; he applied to the Indian Office), he is reminded that he had better do so.

Q. I see it stated in a communication from General Sheridan, under date of November 20, 1877, that the Indian agent did not advise the officer about the disturbance which existed. Is that a fact?—A. Precisely so; and that is what Mr. Danilson was censured for.

Q. Is it not true, under the present management of Indian affairs by the Interior Department, that the Government of the United States has a double set of agents, namely, the civil agent over the Indians and the officer in charge of the post, who is held accountable for the manner in which Indian troubles arise and are disposed of?—A. That is true in the same sense that it is true with regard to any other trouble. When we have any international trouble the Army is called upon in the same way. When we have any trouble, as, for instance, the riot on the Baltimore and Ohio Railroad, then troops are called upon in the same way.

Q. In point of fact troops never interfere except when called upon by the proper authority?—A. That is the principle of constitutional government, that the Army should be subordinate to the civil authorities.

Q. There have been numerous conflicts of opinion as to whether or not the various Indian wars, extending from the outbreak of the Northern Cheyennes this year and the Bannock trouble back to the Sioux wars, as to what has been the cause of their origin—whether the civil or military agent was to blame?—A. We know that wars broke out under military management, and there can be no doubt as to whether they were attributable to them or the civil officers.

Q. My question referred to the Cheyennes and Bannocks and back to the Sioux wars.—A. The wars which broke out after the turning over of the Indian service to the Interior Department? I have cited a number of conflicts, the origin of which is stated in that very report which I have quoted signed by Generals Sherman, Terry, Augur, and others. As to a number of other wars, for instance the Modoc, the Black Hill

Sioux war, the Nez Percés war, and so on, we all know from public notoriety were about land.

Q. Why was it your agent Danilson did not apply to the nearest post at the time of the Bannock trouble?—A. At that time the war was not immediately threatened. The Commissioner of Indian Affairs reminds me of a circumstance which had slipped my mind. The communication between the agency and the fort is across a mountain range somewhat obstructed, and the agent had to travel some distance to get there.

Q. How far?—A. About 25 miles. So the fort was not within immediate reach. He could reach the nearest telegraph station in two hours. The Indian agent was afterward reminded that while reporting by telegraph to the Interior Department he should at the same time send some one to the commander of the fort, which, however, in that case would have been comparatively less important, because the outbreak of the troubles was not as immediately imminent as afterward.

Q. You spoke of a transaction of certain defaulting agents and contractors, and also of a single conviction which had occurred. Do you know of any convictions under the civil processes of the government of defaulting agents and contractors?—A. We have not had any trials except that one; or rather the same man being tried once before, the jury rendered a verdict of not guilty; but now he was tried upon another charge and found guilty and is in prison.

Q. That is the only conviction?—A. That is, under my administration.

Q. How many convictions have taken place under your predecessors since the bureau has been under the Interior Department?—A. I must say I cannot give, from my own knowledge, an answer to that question. Just as little I know whether any trials and convictions took place under the War Department for similar causes in Indian management.

Q. Have a great many instances been brought to your notice of defaulting agents, and how many prosecutions have taken place?—A. In some instances, where agents have been reported upon, the cases afforded sufficient proof to suspend them, but insufficient for criminal prosecution; yet when there was enough proof to produce a moral conviction that those agents were guilty of improper practices, they were removed. Where the evidence was such as to warrant criminal prosecution, the case was turned over to the Attorney-General for that purpose. Agents are removed for two causes: dereliction of duty, liable to the suspicion of dishonest practices, and for inefficiency. In all, I think, thirty-five changes have been made, some by resignation.

Q. What is the process under the Interior Department of making your purchases of supplies for the Indians, and what is the system of inspection used by you to ascertain whether the goods in point of quantity and quality that are purchased are delivered?—A. The process of making purchases is prescribed by law; by advertisement, bids, and by contract. Supplies, when delivered, are inspected, whenever possible, by a military officer. As to the system of inspection in detail, I think it would be well to have the Commissioner of Indian Affairs, who has gone through the whole manipulation, state to you the details. Although I am conversant with it, I might forget points which he would be quite ready to give you.

Q. The annuities paid to the Indians, which are paid in the shape of rations distributed among them, are distributed according to census how taken?—A. According to actual count taken by the Indian agent.

Q. The Indian agent makes the count, does he?—A. Here is a paper which it would be well for the committee to examine. It is an exact example of how rations are issued at agencies (presenting the paper).

Q. How do you ascertain the number of Indians; by actual count and report of the agents at the respective agencies?—A. Yes, sir.

Q. Have you ever discovered any inaccuracies?—A. Why, certainly.

Q. In those reports thus made?—A. Certainly.

Q. To any large extent?—A. Sometimes inaccuracies have occurred to the extent of quite a proportion. How difficult it has sometimes been to keep track of the number of Indians you find in the Cherokee removal conducted by the War Department, where 1,633 were paid for in that removal that were not transported at all. Those things have undoubtedly occurred. When inaccuracies are found they are now promptly corrected.

Q. Are you aware of the inaccuracies in the estimation of the number of Sioux Indians who were furnished supplies by the department?—A. Of late?

Q. From 1873 to the present time.—A. I think there must have been inaccuracies previous to my administration, but as to the present time I doubt whether there are any.

Q. Are you aware of the fact that at one time several officers of the Army in succession were detailed as agents of the Sioux Indians?—A. Yes, sir; that was in some instances done at my request.

Q. I refer to the occasion when Lieutenant Foote was detailed as agent of the Sioux tribe and he was subsequently succeeded by the detail of another officer belonging to General Crook's command, by the name of Lieutenant Lee?—A. I know Lieutenant Lee very well.

Q. Are you aware of the number of Indians which the former agents were drawing rations for, and the number actually found upon count?—A. It is my recollection that Lieutenant Lee came to that place about the time I came into office, but as to what happened before that time of course I would respectfully disclaim, not only all responsibility, but it cannot be expected that I should be as conversant with facts which happened in the past as those under my administration.

Q. Does your recollection serve you as to the civil officer who preceded him?—A. The civil officer had been relieved.

Q. The means of obtaining the actual number to whom rations are to be issued is by count made by the agent, and the distribution is made in accordance with that; but in reference to the custom of inspection, is it not under present regulations the duty of the agent at the post, when supplies are furnished by the department, to call in an inspector from the Army for the purpose of making the inspection?—A. Yes, sir; that is made the duty of an agent wherever an Army officer is obtainable.

Q. For the purpose of inspecting the character of the goods?—A. Yes, sir.

Q. Is that complied with at the agencies generally?—A. It is complied with generally, wherever an officer is obtainable. He inspects a certain class of supplies according to regulations, and I think there are scarcely any exceptions of this being complied with except where an officer is not to be had. Permit me to say that, as to the business methods in detail of the Indian service, it might be desirable for the committee to visit the Interior Department and go into the Indian office and inspect there the methods of accountability, of inspection, and of everything else in the books themselves, so that you may see exactly how these things are done. You would in that way undoubtedly get a much clearer perception of the whole matter than by merely asking questions.

Q. You spoke of the comparative cost of transportation under the head of economy. You spoke of the Army transportation, and of the transportation of supplies purchased by the Indian Department, stating

that the transportation of the Army was $4,000,000, while that of the Interior Department was—?—A. $225,000.

Q. Do you mean to say by that that the transportation—the actual cost of the transportation—of supplies *per capita* to the soldiers, and of the transportation to the Indians, has that difference between them?—A. I did not make any statement in detail. I merely adverted to the statement made, as I saw by the newspapers, by General Meigs before this committee, that the transportation of the Army cost $4,000,000, while ours cost $225,000.

Q. Your transportation account, of course, does not include the transportation of men?—A. O, no; certainly not. I think I stated, also, that the Army had to transport not only supplies and clothing, but sometimes munitions of war and men, while, on the other hand, the number of persons we have to provide for is much larger. We do not transport any Indians, under ordinary circumstances, except in case of removal. The transportation of men, of course, increases the account of the Army. I disclaim any intention—and I want that emphatically understood—to say that there is willful neglect, or anything of that kind, on the part of the Army. I merely suggested from the two facts the inference that, when inquiring into the details, you would probably find the transportation rates paid by the Army and the rates paid by the Interior Department to be in favor of the Interior Department.

Q. The methods of the Army, under the Commissariat and Quartermaster's Departments, have very much improved since the period you refer to, of 1834?—A. I suppose so; and so have the methods of the Interior Department.

Q. The method of purchasing supplies through the Quartermaster's Department and commissariat of the Army, as now existing, is very correct?—A. I am not a judge of that; but I hope and suppose it is.

Q. Are you not aware that it is impossible for an officer occupying a position in either of these departments to be guilty of a violation of authority or maladministration of moneys intrusted to him without detection at an early date?—A. My experience in public affairs leads me to be exceedingly sparing in the expression of judgment that a certain thing is impossible in the conduct of such affairs.

Q. I do not mean to assert that it is impossible; but is it not probable that, in an improper application of funds intrusted to them for the purpose of distribution, in accordance with the regulations of the Quartermaster's Department and commissariat of the Army, there would be an early finding out under the present system?—A. It may be very naturally assumed that I should be more conversant with matters in the Interior Department than in the War Department, and I do not think I should be justified in expressing any definite opinion on that point. I have a very high opinion of the gentlemen at the head of the Quartermaster's and Commissary Departments. I am sure if they detect any abuses they would be quite ready to correct them; but as to their business methods, I must confess I have not looked into them.

Q. What is your opinion upon the question as to whether or not in the case of the Indian tribes, where it is necessary to have the military posted near or adjacent to the agency for the purpose of enforcing the authority of the agent whenever it is resisted by the Indians, it would not be safer and more prudent to intrust the authority to one discreet officer rather than to have two agents to judge of the question as to what shall be done?—A. I do not think we have two agents there.

Q. We have a civil agent there to administer the civil affairs of the Indians, and we have an Army officer near and ready in case of trouble.—

A. You might just as well say, here is the city of New York full of turbulent elements, and the police are called upon to repress trouble, as the military are sometimes to repress trouble on or near some Indian reservations; from which others might, but I would not, draw the conclusion that it would be well to intrust the general affairs of the city of New York to the police force. There is a civil agent to administer the civil affairs of the Indian tribes, and there is a military officer in command of the force to repress trouble in case of need. Troubles at Indian agencies are not more frequent than trouble in the city of New York which calls for the interference of the police. The parallel of the two cases is evident. If the military officer standing ready at an Indian agency to repress occasional trouble is to be intrusted with the civil management of the Indians, the same argument may apply to New York City that, as the police are called upon much more frequently to repress trouble, the civil affairs of the city should also be intrusted to the police.

Q. The military, like the police of the city, do not interfere with anything until called upon?—A. I think it is the rule that each should attend to their respective lines of duty.

Q. In the instances of the Army officers being detailed for the purpose of acting as Indian agents, have you found them to act with fidelity?—A. I have already expressed to them my obligation for the fidelity with which they have discharged their duties. At the Sioux agencies we had officers of the Army placed in charge to conduct some of the removals of those Indians, and other temporary arrangements, and they have discharged those duties with great efficiency.

Q. Have they not discharged their duties very much to the satisfaction of the Indians?—A. I think, on the whole, they have. I might say, at the same time, some were suggested by ourselves and they acted under the direction of the Interior Department.

Q. Their administration has been satisfactory to the Indians?—A. Decidedly so, I am glad to say. I will add, however, that the duties they have had to discharge at some of the Sioux agencies, particularly Red Cloud and Spotted Tail, had scarcely anything to do with the civilization of the Indians. There were removals and similar arrangements to be attended to, which arose in consequence of the unsettled state of things. We are now having those tribes settled upon tracts of land where they expect to remain, and the military officers partly have been and partly are to be relieved, and civil officers put in their places. In fact, some of them have already been relieved.

Q. Are you familiar with the condition of the Modocs and Nez Percés who have been of the last subjugated of the savage tribes?—A. I think I am familiar with it.

Q. Are you aware of the fact whether any complaint came from them of the inspection and misappropriation of supplies?—A. The complaints which have come referred more to medicine than anything else. The Commissioner of Indian Affairs informed me that at the Nez Percés Agency the flour and beef were not good, but were received by an agent who was afterwards removed.

Q. Are you aware of the fact as to what has been the effect of the removal of those tribes from the more northern portion of the country to which they were acclimated to this southern country?—A. Yes, sir; and from the knowledge I have of that fact I have come to the conclusion that it is not good policy to remove Indians accustomed to a northern climate to this southern country. The Poncas and Nez Percés were removed there under the present administration, the former in pursuance of legislation, the latter after a consultation with General Sherman. If

the Nez Percés had been sent back to their country, the outrages which had been committed upon the whites at the beginning of their war would have aroused a spirit of retaliation and the whites would have been likely to visit revenge upon them. This was the idea of General Sherman, as well as ours.

Q. From this experience is not your opinion for the preservation of the Indians to keep the southern Indians in the southern country and assigning the northern Indians to a northern country?—A. I am decidedly of that opinion, and I so expressed myself in my report. I think great mistakes have been committed in that respect. I repeat, of the removals to the Indian Territory under my administration, one was ordered according to law, and the other resulted from the peculiar situation of the Nez Percés. My opinion is that we can gradually gather the southern tribes to the Indian Territory, and for the northern tribes we should set apart reservations in the north.

Q. You spoke of the civilization, and, as I understood you, of the division into severalty of lands. Are you of the opinion that if the Indian Territory, for instance, was divided up into severalty, either *per capita* or to the heads of families such a number of acres, that the Indians would be able to preserve that Territory?—A. My opinion about that point is this: I think that we should under any circumstances be very careful in distributing among the Indians lands in severalty to be disposed of freely by themselves, and in giving them the rights of citizenship. In my opinion Indians should not be put into possession of lands in severalty except under certain restrictions, making the land inalienable for a certain time. Also to give them the rights of citizenship and turn them loose will if done too early in very many cases, make them vagabonds.

Q. The destruction of their tribal relations and the division of their lands into severalty, unless guarded by the restriction of non-alienation, would virtually amount to destruction of the reservations assigned them by the government?—A. I think we ought, upon all reserves where the Indians have attained a certan degree of civilization, to introduce the system of allotment of lands among them, for the time being, under a proper restriction as to alienation. As to the dissolution of their tribal relations, that is a matter which cannot be done by direct action of the government alone. As soon as they are in possession of lands in severalty they will gradually part themselves. I should be very careful in pushing these measures with haste. I think hasty steps in that respect might result in great detriment to the Indians. At the same time, I think where the state of civilization of the Indians warrants it, we should allot lands among them, and give them a sense of the responsibility of property-owners, and fix them in severalty as far as we can.

Q. You would not apply that to any but the semi-civilized tribes?—A. Take, for instance, the Sioux. The Sioux will scarcely be called now semi-civilized tribes. But if the Sioux remain quiet upon the reservation they now hold, and begin to work, it will soon be well to divide lands among them in severalty and gradually develop that system.

Q. Would the assignment of an officer to act as agent at each of the Sioux agencies interfere in any way with or impede the advance of civilization or their support by agriculture or otherwise?—A. I have already, in connection with the opinion expressed by Generals Sherman, Terry, Augur, Harney and others—an opinion with which I most heartily concur—stated that to lead the Indians on in the way of civilization instead of war, to educate them, and give them the support of civilizing influences, is a thing which requires long, assiduous, and patient work,

for which I do not think the military organization is the proper instrumentality.

Q. The fact which I want to get at is, whether you found under this actual experiment which you made by detailing Army officers to act as agents their advancement towards civilization or their support retarded in any way?—A. I think I have answered that question already, by stating that while those military officers were in charge scarcely any advance had been made or could be made towards civilization, because the Indians were moving or in an unsettled condition. They are now settled, and it is the intention of the Interior Department to have civil officers in charge of those tribes. So in regard to their capacity to aid the civilization of the Indians, these cases furnish no experience at all.

Q. When the War Department did detail the officers for the purpose of acting as agents at the Sioux agencies it didn't at all interfere with the necessity for the farmer and the wood-worker and the blacksmith and all the other ordinary officers, did it?—A. As to the Red Cloud and Spotted Tail Sioux Agencies, it did not interfere with such things, inasmuch, as I said, there was no opportunity for setting those civilizing influences in motion. The tribes were not in such a condition that it could be done. They were not where they were to remain, and of course they would not be set to farming when they had to leave in a short time.

Q. Is it your opinion that the detailing of an Army officer to act at an agency of the Indian tribes would of necessity prevent the employment of those other civil agents whose duty it would be to instruct them in industry?—A. Of course not; I answered that question. Civil employés would be needed for various employments and duties, for, even if proper persons could be found in the Army for such employments, they could scarcely all be drawn from the Army, their number being considerable, unless you want to increase the Army. If you mean to do that, you have no better way than to take all the employés of all the agencies from the Army. This draft upon the active force would probably render it necessary to increase it.

Q. I find, upon reference to the document which was referred to in the testimony of Lieutenant Lee, in General Crook's command, in reference to this agency there, that it is a report of Lieutenant Foote, who was the first officer detailed, and that Mr. E. A. Howard was his predecessor.

Mr. Commissioner HAYT. That is correct.

Q. He states that when he was detailed as a military officer to take charge of this agency, he made an actual count of the number of Indians there, and that there were 4,614 at the time when he made the enumeration, but that Mr. E. A. Howard, the late agent here, transferred to him on his list 9,134 Indians. Are you cognizant of these facts or did they occur before your administration?—A. That was before I came into office. We became cognizant of the facts, I think, and Mr. Howard was subsequently removed.

Q. He was removed and a military officer put in his stead?—A. Mr. Howard was removed.

Q. Was any difficulty ever found in the department with reference to the revision of the census and the enumeration of Lieutenant Foote?—A. I think I may give to the question a general answer. If you desire to make me admit that many irregularities occurred in times past in the Indian Office, I shall certainly be the very last man to deny it. If you will read the report which was made by the commission appointed by me to investigate Indian affairs, you will find all these things, as far as the commission could go. There was no secrecy about it. I disclosed

those facts myself, for the purpose of improving the service wherever abuses existed.

Q. If, in point of fact, the former agent, Howard, had been issuing rations for nine thousand and odd Indians, then he must have issued double the amount necessary?—A. That would seem to be a justifiable inference.

Q. How long had he been agent?—A. I am not aware. He was removed, but had not been appointed under my administration.

Q. This question becomes pertinent because of your general charge that officers of the Army were not qualified to transact the business of the agency.—A. I would guard myself by saying that one of the measures I would propose is to relieve the President of the present restriction as to employing military officers in the Indian service. I can put my hand on certain officers whom I would like to have in the service, individuals whose service I would not only accept but seek, under the direction of the Interior Department; but, as a general rule, I think the Army management would not be conducive to the welfare of the Indians.

Q. I was merely referring to particular cases.—A. I had never denied that, but, on the contrary, admitted it in my general remarks upon that subject.

Q. Your opinion coincides with General Crook's, that there are some incompetent and some competent military officers. Would not that hold good with reference to civil agents?—A. Unquestionably. If you will permit me to make a general remark, I will say this:

It has to be taken into consideration that, under the civil branch of the government, the Indian service exists by itself. If well administered, it is regulated by its own interests. If you transfer the Indian service to the Army, then the service is regulated by two interests; first, by its own, the interest of the Indians; and, secondly, by the interests of the Army. Now, if the interests of the Army and the interests of the Indians do not agree, it is very questionable to my mind whether the interests of the Army would not frequently dominate.

Q. Do you mean to imply that there is any interest in the Army hostile to the Indians?—A. Not hostile; but I say simply that there may be things desirable for the accommodation and convenience of the Army which are not so desirable for the Indians, and that in such cases it is questionable whether those things desirable for the accommodation of the Army rather than for the interests of the Indians would not be preferred. I do not suggest any hostility or lack of good faith in these matters, but under Army management such conflicts of interest and conveniences may frequently and naturally occur; while, when the Indian service is conducted by itself, it is conducted with only one single object in view.

Q. Don't you think that an officer of the Army who has had large experience upon the Indian frontier—take for instance such a man as General Crook, of the Department of the Platte, and who has inspired confidence in the tribes with which he came in contact as to his fidelity and desire to keep whatever promises he makes with the Indians—that an officer of that sort would make a competent and satisfactory agent, who would conduct the affairs of the agency with reference to the true interests of the Indians?—A. I think if all the Indian agencies could be managed by General Crooks I should have a great deal of confidence in their judgment. But I must say also that not only in this Army but in any army the General Crooks are, in my opinion, not very plenty

By Mr. McCREERY:

Q. You spoke of the number of resignations in connection with the number of removals; have you any idea what number have resigned?—A. I think about ten or twelve.

By Mr. SCALES:

Q. In reference to the statement you made in regard to the abuses under the War Department, I believe you quoted from a report made in 1834.—A. Do you mean the report of Colonel Hitchcock?

Q. Will you state to the committee what the organization of the bureau was at that time?—A. It was under the supervision of the military department.

Q. What was its administration; was it not civil rather than military?—A. They undoubtedly employed many civilians, as the Army would have to do under any circumstances, but it would be under the general direction of the War Department in a similar way as now the Secretary of the Interior directs the conduct of Indian affairs, and is responsible for it as a controlling and supervisory officer. The Commissioner of Indian Affairs is charged with the details of the service, but the Secretary gives general and sometimes particular direction. They had undoubtedly a similar arrangement. The Secretary of War had an officer like the Commissioner of Indian Affairs under him to conduct the details of the service, but the whole thing was under the general direction of the War Department.

Q. Was not the same organization, as now, responsible to the War Department instead of the Interior Department?—A. It was naturally much more in the hands of the Army.

Q. Were not all the agents strictly civilians?—A. A good many civilians may have been employed.

Q. Do they not, in that report, allude to the fact that the President has power to appoint military agents?—A. Yes, sir. The main point is that the Indian service was under the control of the War Department; if you put it again under the control of the War Department, you could not wisely oblige the War Department to employ only military officers, because it would not be possible to do that; you would have to employ many civilians for certain duties, but under military direction.

Q. My only object is to understand the organization of the bureau at that time.—A. Of course they used a good many civilians, because it was impossible to get along without them, but the general direction was military.

Q. In order to get at the facts of the report of that peace commission, I would refer you to the report of that commission later—in the fall, I think. You read from their report in January—that resolution of the same peace commission.—A. I think you are mistaken in the matter. I think this resolution preceded the other report. I am not sure about it. Still, it is immaterial. However, I think that report I quoted is referred to by the Commissioner of Indian Affairs in his report printed at the head of this volume.

Q. The two reports are conflicting?—A. Yes, sir.

By Mr. BOONE:

Q. I think the present state of your evidence upon the subject of the transfer would do violence to your sentiments, and therefore I want to ask you a few questions. You have referred to the fact that some one had stated that the transportation of the Army was about four millions of dollars?—A. Yes, sir.

Q. While you stated that the transportation for the Indian Bureau was but $225,000?—A. Yes, sir.

Q. Which would seem to leave the impression that you made it a parallel case, and that the transportation for the same number and character of articles would be largely in excess under the War Department?—A. I disclaim that. It would not be as unjust, in the same line of remark, as General Marcy was in saying that the management of Indian affairs cost $800,000 under military administration and $5,000,000 under the civil department.

Q. The transportation of the Army—I mean of supplies, clothing, and provisions—is a very small part of their transportation?—A. I suppose it is only a part, how large I cannot tell. But I think upon investigation you will find that our transportation rates are lower.

Q. I understood you to say that one of the great questions to be solved in the management of the Indians was to protect them on their reservations from the cupidity of the white men who were surrounding those reservations, and who desire their good lands. That is true, is it not?—A. Undoubtedly.

Q. One of the great troubles we have to contend with now arises in consequence of that?—A. Yes, sir.

Q. Would it in your opinion be safe to withdraw the Army stationed near those reservations even for a day, or at least for any considerable length of time?—A. I did not intimate any such desire on my part. It was with a view of exactly that state of things of which you speak that I suggested that the President be authorized, when in his judgment it was necessary, temporarily to turn over certain reservations or Indian tribes, even under the articles of war, if that could constitutionally be done, to the temporary control of the Army, as long as trouble exists or is clearly imminent.

Take a special case. There is the Umatilla Reservation. The Umatilla Indians occupy land which has become in the course of time very valuable, and they are much crowded upon by the whites who want that land. They may resort to instigations of trouble so as to bring about an opportunity for taking that land, and thus we may have another outbreak, and a conflict between whites and Indians. I do not pretend to be very minutely advised of the condition of things there; but there are rumors of that kind, and I use this only as an illustration. I can imagine cases where, if the President were authorized to do what I here propose, I would myself advise him to do so. So I do not mean that the military posts should be withdrawn; but, keeping in view the peculiar duties they have to perform, I suggested that in my opinion Congress would benefit the service by giving the President authority so to employ them when in his judgment desirable.

By Mr. STEWART:

Q. The numbers to be supplied differ greatly. In the Army there are 25,000, and of the Indians 250,000?—A. Certainly. But I repeat I do not, with regard to the transportation matter, desire to throw any suspicions on the integrity of the management of the Army. In the second place I admit that the Army has to transport certain things, such as ammunition and soldiers, which we have not to transport in the Indian service. At the same time I say that the number of the Indians to be supplied is a great deal larger than the number of soldiers; that the difference of the aggregate cost of transportation between the two branches of the service is very great, and that if you will take the trouble of looking into the matter, it will be probably found that we transport at much cheaper rates than the Army.

E. C. WATKINS sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. Grand Rapids, Mich.

Q. What is your occupation?—A. Inspector of Indian affairs.

Q. How long have you been inspector?—A. About three years and seven or eight months.

Q. You are inspector at present?—A. Yes, sir.

Q. Have you inspected many tribes?—A. Yes, sir.

Q. What tribes have you inspected?—A. I have inspected the condition of the Arickaree, Mandans, Gros Ventre, Blackfeet, Piegans; all the tribes on the Pacific coast; the Apaches, Utes, and a large majority of the tribes in the Indian Territory; in fact, a large majority of the tribes of the United States. Most of the different bands of the Sioux I have also visited.

THE INDIANS OPPOSE THE TRANSFER.

Q. The committee is charged with the business of inquiring into the expediency of transferring the management of the Indian Bureau from the civil or Interior Department to the military or War Department. We would like to know whether or not you think, from your experience among the Indians, it would be better for the government or for the Indians, or for both, to make this transfer; and if you think the change should be made, please give your reasons.—A. I think the Indians regard the transfer to the Army as a menace to them, and I think, consequently, it would discourage them in their work, reduce the amount of agricultural labor, and operate against their education. That is, I think they regard the Army as their enemy; that the troops are stationed in the Western country on the frontier for the purpose of controlling the Indians by force. I speak now of the general understanding of the Indian tribes.

Q. As a general thing the Indians are opposed to making the change?—A. Yes, sir; I think so.

Q. Do the Indians understand the motive of the change; that is, do they not as a general thing think if the change is made, that they will be put under military command at once and military rule, and that it would be a change from a civil to a military rule rather than merely a change from civil to military officers?—A. I do not think they understand the *minutiæ* of the change; that is, how the system would work if the transfer were made; but they do understand that in lieu of the civil agents they are to have officers of the Army detailed as agents, and to that extent will be under the control of the military. I think the general sentiment toward the officers of the Army is not such as would lead them to desire to have their affairs placed under their charge.

Q. They would prefer not to be placed under military men?—A. The rules governing the military being arbitrary rules, are not such as the Indians would desire to be controlled by. The Army officer himself understands that he is stationed on the frontier for the purpose of controlling the Indians by force. That is what he is sent there for—sent there to fight and not to educate Indians. That has been his business for all the years he has been located on the frontier among the Indians. If the transfer is made, and an officer detailed to take charge of the Indians as agent, of course their welfare and civilization are under his direct charge. It requires very great patience and much good judgment and perseverance on the part of an agent to civilize Indians; and we have found by experience that with those qualities an agent does succeed in civilizing them.

THE INDIANS DESIRE TO WORK AND BECOME SELF-SUSTAINING.

Q. Do you find among the Indians a disposition to work and become self-sustaining and to look forward to the time when they will have to take care of themselves, or are they still holding on to the bow and the arrow and to hunting for a living?—A. I find a large sentiment in favor of working and a desire to be self-sustaining. Some tribes do not seem to have this desire very strong, while a few bands are opposed to working. A large majority of the Indians in the United States, the most intelligent of them, desire to work, have begun to work, and express a wish to live as white people live, and to cultivate land and become self-supporting.

EDUCATIONAL FACILITIES.

By Mr. STEWART:

Q. Have these tribes schools established among them as a general thing?—A. They have in almost all the tribes. More schools should be established among them than have been.

By the CHAIRMAN:

Q. Do they encourage their children to attend the schools, or are they indifferent, or do they throw obstacles in the way?—A. As a rule, the children are willing to go and the parents desire that they should. There are exceptions, but as a rule that is true. There is one trouble in this matter—we could put more than twice as many children in school if we had accommodations for them. The school system among the Indians has to be controlled by the amount of money appropriated, and schools cannot be established in many places where they are needed and called for because of the want of funds to maintain them.

Q. Do the Indian children take to schooling? Do they learn rapidly?—A. They learn, perhaps, equally well as in a community of white people. I do not know but they acquire even more rapidly than white children after they learn our language. We have Indian children who in their examinations show as great advancement as in our common schools in the country.

THE INDIANS DESIRE TO BECOME FARMERS.

Q. What is the progress of the Indians in the matter of farming or cattle-raising? Are they disposed to go into the farming and herding business?—A. I have been in many of their farming communities, and I have found that in a large majority of cases the Indians east of the Cascade Mountains, in the Northwestern Territories and in the State of Oregon, are generally desirous of farming. On the Yakimaw Reserve almost every family has a separate farm; they live in houses, and cultivate the soil, and are almost, if not entirely, self-sustaining, so far as furnishing food for their sustenance is concerned; this is true also in California.

Q. Do you consider the Yakimaw Indians a warlike people? Are they dangerous?—A. In my judgment, no. They are entirely peaceful now. I do not think any danger is to be apprehended from them. They are capable of sustaining themselves, they do sustain themselves, so far as food and clothing are concerned, and a very small issue of goods is made to them. This is also true of the Indians on the Pacific coast—"Digger" Indians, they are called. There are five or six tribes that go under that general name.

Q. When in California, we had difficulty in finding a name for them. They are named, I believe, after their reservation?—A. Yes, sir. In a

great many other places the Indians are equally advanced. Those on the reservations, in the Indian Territory, and the Apache Indians at San Carlos Agency in Arizona, who up to within a few years ago were hostile, now manifest an interest in farming and stock-raising. Some of them are cultivating the land and raising stock, and they manifest a great interest in accumulating cattle, saving much of the beef that is issued to them alive for purposes of stock-raising. Many of them were cultivating land last year, and some families had become self-sustaining, although they are not yet self-sustaining as a tribe, but are approaching that. They are very willing to work, and are anxious to have schools, and have asked earnestly for schools, and lately the Commissioner of Indian Affairs has authorized the construction of a school building for them. I speak of the consolidated Apaches—a consolidation of four agencies—the Camp Kearney, Warm Spring, Chiricahua, and San Carlos Indians. These four bands were removed to the San Carlos Agency some two years ago, under the direction of the Secretary of the Interior, and this removal was peacefully accomplished by the agent, without assistance to any great extent from the Army.

As to the firing of the agency buildings, that has been the subject of much controversy; that was, to my knowledge, neither the work of the Indians nor of the agent, but of some white men, hangers around the agency. The buildings were almost worthless after the abandonment of the agency, being simply log structures, and not costing originally more than $2,000, instead of the $20,000 that was named in General Marcy's statement.

ARE THE INDIANS INCRBASING OR DECREASING?

Q. Are the Indians holding their own as to number, or increasing or diminishing?—A. Some of the tribes are increasing, others diminishing through disease. Where the policy of the present administration of affairs is carried out fully, I think the Indians are increasing. My experience as inspector leads me to the belief that a large majority of the Indian agents and employés are honest and capable men. This is especially true of the last four years, since I have been connected with the Indian Bureau, and I am satisfied that in that time the service has very greatly improved.

COMPENSATION OF INDIAN AGENTS.

Q. What compensation do the Indian agents receive?—A. From $1,000 to $2,200 per annum. Very few receive the highest-named sum. The average would be $1,500 or under.

CONSOLIDATION OF THE INDIANS ON FEWER RESERVATIONS DESIRABLE.

Q. What is your opinion as to the consolidation of the Indians upon a fewer number of reservations?—A. I think it is practicable and very desirable. I should place the Oregon and Washington Territory tribes and the tribes in Northern Idaho—all east of the Cascade Mountains—on one reserve. Those west of the mountains, living on the coast by fishing and on the water, should be placed on another reserve. The Indians of the Southwest, in Arizona and New Mexico, should eventually be moved, I think, into the Indian Territory, and consolidated with those already there. Another reservation would probably be necessary in the northern section of the country east of the Rocky Mountains. Eventually this consolidation could be effected, and the number of agencies be thus reduced. That is being done, I think, from year to year.

By Mr. HOOKER:

Q. You say you are acting in the capacity of Indian inspector?—A. Yes, sir.

Q. How long have you been inspector?—A. Three years, and seven or eight months.

Q. By whom were you appointed to your post as inspector?—A. By President Grant.

DUTIES OF INDIAN INSPECTORS.

Q. What are your duties?—A. They are so extensive it would take some time to enumerate them. As inspector of Indian affairs, to visit the different agencies, look after the shipment of supplies and goods, examine the reservations, look into the general condition of the Indians, report upon their advancement or otherwise, make suggestions as to improvements, inspect the schools, and supervise almost everything pertaining to Indian affairs.

Q. How many other like inspectors are there?—A. Two others.

Q. Three of them?—A. Yes, sir; whose duties are defined by law.

Q. And you act under regulations prescribed by the department?—A. Yes, sir.

Q. To whom do you report?—A. To the Commissioner of Indian Affairs.

Q. Are you bonded officers?—A. Yes, sir.

Q. What bonds do you give?—A. I give $5,000 in bonds.

Q. Your duties consist in visiting the various Indian agencies and reporting their condition, &c.?—A. Yes, sir.

Q. And report to the Commissioner of Indian Affairs?—A. Yes, sir; and to the Secretary of the Interior.

Q. How often do you visit the agencies?—A. I have been traveling as rapidly as I could travel, in this work, for two years—with the exception of one hasty trip to Washington. I have been on duty constantly for the last two years.

Q. How many times do you visit each agency in two years?—A. A very few of the agencies I have visited twice in three years. There are a few I have visited twice; two or three I have visited three times in three years and a half. In some places it is necessary to delay to examine into matters. We make a great many examinations of charges made against the agents, take testimony, write reports, and forward the testimony with them to the Indian Commissioner's office.

Q. What salary do you get?—A. Three thousand dollars per annum.

Q. Is that the pay of each of the other inspectors?—A. Yes, sir.

Q. Have you visited the Modocs and the Nez Percés?—A. Not since the Nez Percés were moved.

Q. Do you know what the present condition of the Modocs is as to supplies and as to their sanitary condition?—A. I do not at present; no, sir.

Q. Have you visited the Winnebago Agency?—A. Yes, sir; in Wisconsin.

Q. In Nebraska?—A. No, sir; I have not visited the Winnebago Agency in Nebraska.

Q. Nor the Omahas?—A. No, sir.

Q. Your duties, then, consist in making a general inspection of the condition of affairs of the agencies and reporting it?—A. Yes, sir.

Q. Are your reports in writing?—A. Yes, sir.

Q. How long has it been since you made the last report?—A. I made a report yesterday, although not a report of an inspection of an agency; that last one was made some two or three weeks ago.

Q. On the condition of the affairs of tribes which you had visited?—A. Within the last three weeks I have written six or eight reports upon the condition of Indians which I have visited, and business connected with my inspection. I always write a report after visiting an agency, and in addition to that in riding from one place to another upon other questions as to transporting supplies, and concerning roving bands of Indians; and various questions arise which require special report.

DISCREPANCIES BETWEEN GOODS DELIVERED AND THOSE CONTRACTED FOR.

Q. Have you found, in your inspection of the various agencies, any discrepancy as to the character and quality of the goods furnished from those which are contracted for?—A. I have, sir, in a few instances.

Q. In how many instances?—A. In a few I have found a discrepancy; but the usual rule is that the class of articles furnished is the same as those contracted for.

Q. You mentioned a while ago of Indian agents being graded in their compensation from one thousand to twenty-two hundred?—A. Yes, sir.

Q. They get by law $1,500 apiece?—A. The law provides that a salary may be paid from $1,000 to $2,200 at the discretion of the Secretary of the Interior.

Q. They average about $1,500, do they not?—A. I do not think the average is as high as that.

Q. What business were you engaged in when appointed inspector?—A. I was engaged in milling; my leading business was lumber, in Michigan.

Q. Where?—A. Grand Rapids, Mich. I was practicing law before that.

INDIAN AGENTS UNDERPAID.

Q. Do you think a competent business man, capable of conducting the affairs of an Indian agency, and of paying the annuities which the Indians draw from the government, in some cases $40,000 per annum, can be procured for $1,500?—A. I think it is too small, and in very few cases deserves the services of competent men for the disposition of the amount of money you speak of. There are cases, however, where people fail in business, and they are desirous and willing to accept appointment as Indian agents.

Q. Do you think a military officer assigned to duty at one of these agencies, commissioned by the Government of the United States, who has his commission at stake and his character as an officer, would be less likely to deal with fidelity than a civil agent?—A. I do not know that he would be less likely to deal with fidelity in handling funds than the civilian, who has his own reputation at stake; who is reponsible not only to the government but under our custom to the missionary or religious society that nominates him, so that everything that a man would hold dear in the world is at stake.

Q. He is under no bonds to the missionary board?—A. No, sir; but he is under bonds to the government.

Q. You do not think a military officer assigned to duty as agent would be less likely to discharge his duty faithfully than the civilian?—A. I do not think he would have the same inducements to work for the advancement of the Indians as the civilian. The agent holds his office upon the condition of success, and the military officer has a commission

for life. It makes no difference with his position whether he succeeds with the Indians or not.

INDIANS REGARD THE AGENTS AS FRIENDS.

Q. The agents who are generally appointed to conduct the affairs of the Indians are very much trusted by the Indians themselves?—A. As a general rule they are. The Indians generally regard their agents as their friends.

Q. Where they fail to meet their promises, either in furnishing supplies or paying annuities, do they not lose the confidence of the Indians to a great degree; in other words, after a promise to an Indian is once broken he has no confidence?—A. That is the usual view an Indian takes of these matters. Occasionally the Indians try to hold an agent responsible for a statement he makes with a qualification; they do not readily understand a qualification.

Q. You spoke of the Indians regarding the Army as inimical to them. Whenever there is any disturbance on the reserve among the Indians, or any infraction of their rights by others, the agent is powerless unless he calls in the Army to suppress it?—A. I think not at agencies where we have an Indian police. In almost every case of that kind the agent should know early enough to take it in its incipient stages and prevent depredations. In some cases it may possibly pass beyond his control even with the assistance of the Indian police. In that case the military would have to be called in.

CONDITION OF THE MODOCS.

By Mr. BOONE:

Q. When were you at the Modoc Agency?—A. It is nearly three years ago.

Q. What was their condition then; were they cultivating land?—A. Yes, sir; cultivating land pretty generally; at that time they had not been there very long. They were just starting out in what they called the life of the white man. They expressed a great desire to go on in the way the white man lives, cultivating land and having stock, and putting their children in school.

Q. They were then at that time cultivating land?—A. Yes, sir.

Q. To any great extent?—A. No, sir; they had very small farms under cultivation.

Q. How were they living, in houses or tepees?—A. Some in houses and some in tepees.

Q. What character of houses were those living in who occupied houses?—A. Generally board houses, put up by the government, by the agent; just plain board houses.

Q. Sawed lumber?—A. Yes, sir.

Q. Were they then dressing in citizens' clothing or were they blanket Indians?—A. Some dressed in citizens' clothing and others with blankets. Probably three-fourths of them were in blankets.

CONDITION OF THE SHOSHONES.

Q. Do you know anything about the Shoshones?—A. Yes, sir.

Q. When did you see them?—A. I just came from the Shoshone and Bannock Agency.

Q. How are they progressing?—A. Fairly well. The Shoshones, as a rule, better than the Bannocks. There are three-fourths and perhaps nine-tenths of the Shoshones living on farms; that is, farms within the

reservation, and at work cultivating the lands, and at least one-half are self-sustaining.

Q. Most of them are at work? They seem to manifest an industrious disposition?—A. Yes, sir; the Shoshones do. They seem to desire to cultivate land, and have an ambition to be self-sustaining and independent.

Q. Do they still dress in blankets or citizens' clothes?—A. They are divided; I should suppose about half and half.

Q. Are there churches among them?—A. No, sir; no churches among the Shoshones—no church buildings. They have service at the agency occasionally, but there is no regular missionary among them now.

Q. Do they attend church when opportunity affords?—A. They attend church, I think, when it is held there. I have been among the Shoshones twice, officially. Two years ago when I was there I happened at the agency on Saturday and remained over Sunday, and they came in on Sunday to hear a "talk from Washington," as they expressed it; and I was told by the agent they were very prompt to appear when he sent word to them of a missionary preaching.

Q. What are their numbers?—A. On the Fort Hall Reservation, 900, I think. On the Shoshone and Bannock Reservation it is a little difficult to get the exact number of Shoshones, because they are closely allied to the Bannocks, and they are counted together.

By the CHAIRMAN:

Q. Are the Shoshones and Bannocks holding things in common?—A. Yes, sir; holding everything in common. They have their ponies separately, but their farms are in common.

Q. Are the two tribes living together?—A. Together on the same reservation; here a Bannock and here a Shoshone.

By Mr. SCALES:

Q. Are the crops in common?—A. No, sir.

By the CHAIRMAN:

Q. There is only one agent for both tribes?—A. Yes, sir; one agent at each agency. There are two agencies.

Q. One at Fort Hall and the other at Camp Brown?—A. Yes, sir.

JOHN D. MILES sworn and examined.

By the CHAIRMAN:

Question. You are an Indian agent?—Answer. Yes, sir.

Q. At what agency?—A. Cheyenne and Arapahoe Indian Agency, in the Indian Territory.

Q. How long since you left there?—A. The 4th of last month—November.

Q. How long have these Indians been located in that Territory?—A. It was by the treaty of 1867–'68 that they removed them from the Colorado country down into the Indian Territory.

CAUSES OF THE CHEYENNE OUTBREAK.

Q. Were you located at or near the place where the Cheyennes left when they passed to the north lately?—A. Yes, sir.

Q. What do you consider the cause of their leaving? They had some reason for leaving as abruptly as they did?—A. I have to state in first place that about a year ago last August there were 937 Northern Cheyennes sent down from the north. There was Dull Knife's band of about three hundred. He did not affiliate with the Northern Cheyennes before

coming to that country. They were in the Custer fight, and when it came to a distribution of the spoils of war, after the battle, there was some disagreement between them and the Sioux, and, as they said, they threw the Sioux away, and determined to come in and surrender to General Miles, and they came in on Powder River, where General Miles was stationed, and surrendered and expressed a willingness to come south. But it is also due to state that they disclaim any connection with any treaty that the balance of the Northern Cheyennes made.

Q. They have never agreed to that?—A. No, sir.

Q. Did they give you any notice of any intention of leaving?—A. They were dissatisfied, and expressed a dissatisfaction at remaining at the south, and we tried every way we could through the influence of the balance of the 650 who affiliated with the Southern Cheyennes, and are there yet, and very well satisfied.

Q. Did they all go?—A. No; about 650 of the 900 remained at the agency; but this particular band of Dull Knife's, who disclaim any connection with the treaty, they were dissatisfied with the manner of issuing rations.

Q. Did they complain or not of the want of supplies or provisions?—A. I do not know but what they did make some general complaint.

Q. Were they supplied reasonably well?—A. I do not think there was any real cause of complaint. It was when there was an absence of sugar, coffee, and other articles, yet there was an increase of beef.

Q. They had a full supply of the more substantial articles?—A. Yes, sir.

Q. Did these Indians destroy or kill anybody or attempt to kill anybody before they were struck by the Army?—A. No, sir; they did not. I think the statement made by the Army officer who pursued them is to the effect that he sent some scouts whom I sent along with the officer (he requested that I should send some Indian scouts along to guide them), and they overtook them and sent these two scouts in the camp to offer an opportunity to surrender. But they said they did not wish to surrender, and did not wish to return to the agency, and that they wanted to go back to the Black Hills, where they belonged.

Q. You think, then, that they had no good reason for leaving?—A. I think not. I think it is an unwise policy in the government to remove Indians who are acclimated to the north so far south that they suffer from disease a good deal—in greater proportion than the Southern Cheyennes and Arapahoes.

By Mr. STEWART:

Q. From malarial diseases?—A. Yes, sir.

By the CHAIRMAN:

Q. And that helped to make them discontented?—A. Yes, sir; that had something to do with it.

Q. I suppose too much dissatisfied to make any attempt to work or to make a living?—A. Yes, sir; they charged our southern Indians with being too much like white people. This is one of the greatest charges against the Southern Cheyennes, that they were going to make white people of them, and they did not intend to submit to any regulations. They required their women to take their sugar, coffee, and flour and pour it out into a general pile on the plaza, and then the soldier element would take the lion's share and then distribute the rest to the people. Now we issue to heads of families. In that way it puts the women in charge of the rations, and they take them right home to their lodges.

Q. That works much better?—A. O, yes.

Q. Those Indians remaining there, are they pretty well satisfied?—A. Yes, sir.

THE INDIANS ADVANCING IN CIVILIZATION.

Q. Are they making any efforts to become civilized, and work with an eye to bettering their condition?—A. I think there has been quite an advance in that direction, and yet it has been slow. Within the last seven years, since I have been stationed at that agency, I can see quite an advancement.

Q. How far are there troops from you?—A. Fort Reno is two miles southwest from the agency.

Q. Those are the troops that followed these Indians?—A. Yes, sir.

Q. You notified them at the fort of their leaving?—A. Yes, sir; I sent the commanding officer, on the evening of the 5th of September, word that I had reports from the Southern Cheyennes that a few of the Northern Cheyennes had left the agency.

Q. About that time?—A. Yes, sir.

Q. On what day did they leave?—A. I notified the colonel to hold himself in readiness, and that if we learned those Indians had gone, he might pursue them and bring them back. I sent the police force out into their camp—to this Dull Knife's camp. They had separated from the balance and would not affiliate.

By Mr. STEWART:

Q. They had done that some time before?—A. That was on the 5th. In order to ascertain whether any of them had left, I directed that the males should come in and be enrolled—to have a roll called—and see whether any had gone. They gave excuses from day to day, and on the 8th, on the Sabbath, I sent the head farmer and the physician to their camps. My idea in sending the doctor was to excuse and get the number of those not able to come in and report, as they had made that an excuse. I thought he could go up and excuse all that were sick and the balance could come in the next day. On the night of the 9th they deserted their lodges and struck out, between ten and eleven o'clock.

By the CHAIRMAN:

Q. How soon did you notify the troops?—A. One of my police brought me word about three o'clock in the morning.

Q. They left in the night?—A. Yes, sir.

Q. Was that one of your Indian police?—A. Yes, sir. One of the Northern Cheyennes, who was in the party at the time they left and who deserted them and came back to the Southern Cheyennes—American Horse.

Q. Do you know what time the troops left the fort?—A. I got right up and talked with American Horse and the police, and got what information I could from him, and at three o'clock started a man to the post to notify Colonel Mizner to send out troops and bring them back.

Q. The army overtook them and had a battle?—A. The colonel had sent out two companies to watch these Indians.

Q. They were on the lookout?—A. They were stationed about four miles from Dull Knife's camp. The information came to me through this police officer, and I sent to the commanding officer, then from the commanding officer back to the troops, which occupied eight or nine hours.

Q. At what date was this battle at which Colonel Lewis fell?—A. The Rundlebrook fight was on the 13th or 14th.

Q. What distance was that from Fort Reno?—A. I should think 120 or 128 miles.

Q. This battle where Colonel Lewis fell is still farther than that?—A. That was the third battle. I think they had a fight with a small detail of troops and cattle and ranchmen south of Dodge City, between there and Camp Supply, and the next was where Colonel Lewis fell.

Q. How many warriors were there in the party who left?—A. Eighty-seven; and I suppose as many as ten boys ranging from ten to twelve years.

HOSTILE INDIANS WELL ARMED.

Q. Pretty well armed, as far as you know?—A. We discovered that some of them were armed. During the time that they remained there they never brought their arms out, as the Southern Indians claimed their best arms were secreted. They no doubt secreted their arms from the Custer fight until they were turned over to me. The Southern Cheyennes claimed they had over a hundred stand of Springfield carbines.

Q. You do not think they started out on a war raid, but were trying to get back?—A. Yes, sir; though they might have had it in mind to fight if caught. They never would have attempted such a trip if they had not been armed. Every hostile savage should be disarmed and dismounted.

THE TRANSFER SHOULD NOT BE MADE.

Q. Our main object is to ascertain whether it would be better to transfer the management of the Indian Bureau from the Interior to the War Department. What do you think of it from your knowledge? Would it be better if it were managed by the military than under the present civil system? And, if you think so, please give your reasons for so thinking.—A. I have had about ten years' experience with Indian affairs. I was stationed three years with the Pottawatomies, and transferred seven years ago to the Cheyennes and Arapahoes. I should judge that the affairs of an Indian agency would be better managed by a civilian officer for one reason: it is very necessary that Indian agents, as well as an Army officer in his connection with the Indians, should put in subordinates who preserve the dignity of his position, and at the same time should, by his own acts and by his own actual experience, be able to preserve the dignity of labor by showing the people how to work. An Indian agent who is not capable of definitely understanding how to take hold and hoe, and don't know how to take hold of the plow, and don't understand how to manage the schools and conduct the affairs of his office, would not be acceptable for the position. A man has got to be a leader, and his employés have all got to be persons who are specially adapted for their several positions.

Q. It don't matter whether a civilian or a military man, so long as he is specially adapted for the position?—A. Well, there might be Army officers fitted for the position. I know I have some as warm friends among the Army officers as anywhere, and I think I have their hearty support. Some among them would be capable of conducting Indian affairs if left at liberty to exercise their own discretion. I do not know what an Army officer would be able to do under Army Regulations. There are a great many of them who have excellent dispositions toward the Indians, or at least toward a good part of them, and yet, as has already been stated, take a great majority of the Army officers on the frontier, their business does not teach people to work; they are reluctant to work; that is not their profession.

Q. They consider themselves fitted for war?—A. That is what they feel.

INDIANS INCLINED TO WORK.

Q. Do any of your Indians take to work?—A. Yes, sir; and I would like to make a little statement of what we are trying to do, and what we have been trying to induce our people to do.

About four years ago I had been having a small school at the agency up to that time, and we had to increase our building so as to accommodate about 100 children. In connection with the school we have a farm of 120 acres of land that has been farmed successfully by the older boys of the school. They have delivered to me one-half of the proceeds of the farm for the use of the materials and implements, and the children who have performed the labor have received the balance. They have generally disposed of the surplus produce to the military or the contractor who has a contract for delivering corn at the post, and we have taken the means obtained in this way and also from the earnings of those people (wherever Indians or children can perform the duties of white employés just as well we always give them the preference. I have stipulations with my school contractor that whenever they can perform the duties required that they should give the preference to the Indians), and the savings thus obtained are put in with those of the sale of produce, and we invest invariably in young cattle for the boys and girls alike. We have a herd of four hundred cattle belonging to the children of that school.

We are 4,000 people and we have 157 children now; we intend in the course of five years, with that herd of cattle and this common fund, to endow that school so as to make it independent of any other support. When they withdraw we propose to give them their proportion, but so long as they remain in the school we intend to keep the herd for the school.

NO NECESSITY FOR THE PRESENCE OF TROOPS.

Q. Is there any necessity for the Army with your people?—A. I think with the increase of the police force there will be no necessity. Since we have organized the police force, within the last six months, I have had no occasion to call for Army officers. I have arrested a number of and punished criminals there with this police force, as, for instance, horse-thieves and persons who were upon the reservation without authority, and bring them into my office and I examine them and send them over to the commander of the post to be put in the guard-house. A few days ago a man was delivering flour upon a contract, and when we came to inspect the flour we found a sack of sand. They had used part of the flour out and slipped a sack of sand in to make up the weight. He had gone about three miles from the agency and I sent this police force out and brought him back at eleven o'clock at night, and I told them to take him to the office and guard him, and if he undertook to pass out of the door to shoot him.

Q. They kept him there for you?—A. Yes, sir; and I took him and showed him what he had been arrested for, and released him. I think there is no difficulty about managing those Indians. I took about 4,000 of these Indians, who have been there in my charge for seven years, and, adding these 600 of these Northern Cheyennes, they are getting along very peaceably, and I think there will be no necessity for force or troops if we have a sufficient number of Indian police.

Q. They have annuities?—A. No money annuities.

Q. All goods and machinery?—A. No money comes into my hands at all.

Q. Goods and supplies, &c.?—A. Annuity goods, and the issuing of

the goods is witnessed by an Army officer; and we always send for one when there is an issue at the agency, and he is present and witnesses the issue, and reports as to quality, quantity, and condition.

Q. You think after a while, if not at present, you can use their own men for these policemen?—A. Yes, sir.

Q. And would finally get along entirely without troops?—A. Yes, sir.

INDIANS AS POLICEMEN.

By Mr. STEWART:

Q. Did you find your police force true to you during the trouble with the Northern Cheyennes?—A. I sent out with Captain Rendlebrock twelve or thirteen, and they did excellent service as trailers, as the officer in command of the detail will admit. One of his soldiers lost his pistol in one of the camps and the captain was fearful that the Indians might get away, and he sent his man back for the pistol. He did not return; he immediately demanded these policemen to go back and look for it. They said they did not want to do that, but wanted to go ahead with the troops; and he told them if they did not want to do that to return home, and all but two returned; those two proved themselves to be successful guides. No doubt they were of assistance, as they are better trailers than the whites, though Dull Knife's band was easily trailed, as they went along with their lodge-poles dragging.

By the CHAIRMAN:

Q. Making a regular move?—A. Yes, sir; on an average of fourteen miles a day.

Q. Did you give the number which left?—A. A little less than 300. They laid an ambuscade for Rendlebrock, which he did not discover until too late. They formed a kind of hollow square, and on their appearance right in front, he watched them and did not think of those on either flank, and he commenced firing. The moment he opened fire he found himself suddenly surrounded by all these Indians, and they would have undoubtedly cleaned out the whole if it had not been for the timely warning of these two scouts.

Q. The scouts were there to help?—A. Yes, sir; and one of them was severely wounded.

Q. They made only fourteen miles a day, you say, and the troops were only nine hours behind?—A. The first day they made a tremendous run, up until the time they were overtaken.

Q. Are not troops capable of traveling faster than that?—A. No, sir; not in that country. Rendlebrock traveled a little faster than that while the Indians were after him.

By Mr. SCALES:

Q. You would be willing now to see the military withdrawn from that post?—A. I think it could be safely done if you will not continue to send those Northern Cheyennes down there, which are the worst characters in the north. Hastings, in his report of 1876, says they gave him more trouble than all the Sioux, those of Dull Knife's band. I dislike to have Indians of that character sent down to interfere with the civil management of our work we have in progress. The treaty of 1876 provides for their being sent south.

KEEP THE NORTHERN INDIANS IN THE NORTH.

By the CHAIRMAN:

Q. Your advice would be, if the government should consolidate to keep the northern Indians in the north?—A. Yes, sir.

Q. Have a reservation provided for those who are acclimated in the north?—A. Yes, sir; decidedly. The Indians west of us could readily be transferred to the Indian Territory from New Mexico and Arizona.

Q. That would be in the same latitude, nearly?—A. Yes, sir.

Q. Those in the southern latitudes might remain there, and for the northern Indians you would advise a northern agency?—A. Yes, sir; there was a point made by a member of the Board of Indian Commissioners, who was questioned pretty closely in regard to missionary labor under military management. I just want to venture a little statement in that respect, although I do it with a high regard for a good many military officers. I had the pleasure of talking with an Army chaplain, at one time stationed on the frontier of Texas. He said it was exceedingly difficult for him to work effectually as a minister of the gospel among troops. He said his efforts were so much neutralized by the general conduct of Army officers in horse-racing and other matters which they engaged in, and he thought it would apply with equal force to the Indians. I know well we have a great many Army officers who are not guilty of such thing, and yet he took the position as a general thing it would be objectionable.

PRESENCE OF TROOPS DEMORALIZING TO THE INDIANS.

Q. You think it has a demoralizing effect upon the soldiers and upon the Indians?—A. Yes, sir; upon both.

By Mr. McCREERY:

Q. What denomination sent you down?—A. The orthodox.

Q. Friends?—A. Yes, sir.

By Mr. HOOKER:

Q. What is the number of the Cheyennes and Arapahoes at your agency?—A. We had 5,053, I think, before these Northern Cheyennes left. There are 647 or 648 now at the agency, and since I left there have been 209 Northern Cheyennes sent to the agency.

Q. There are four or five thousand there?—A. About five thousand.

Q. How long have you been agent?—A. Six years the first of last May since I took charge.

Q. What salary do you get?—A. Twenty-two hundred dollars.

Q. What are your bonds?—A. Thirty or forty thousand dollars.

Q. What amount of annuities do these Indians receive?—A. Fourteen thousand dollars. That is the amount of annuity, and then there is another fund of $20,000.

Q. In addition to the $14,000?—A. Yes, sir; for the purchasing of wagons, harness, and agricultural implements.

Q. So their entire annuity is $34,000?—A. Yes, sir; that is as the treaty provides.

Q. That is the interest due them from the government?—A. Yes, sir; but there was an appropriation or gratuity on the part of the government—you might call it an appropriation—to the three agencies of Kiowas and Comanches, Wichitas, and Cheyennes and Arapahoes, of $240,000, two years ago.

Q. Who disburses this $34,000 at your agency?—A. The Commissioner of Indian Affairs.

Q. He makes the purchases?—A. He occasionally authorizes some little amount to be purchased by the agent out of the $20,000, for implements, &c.

Q. Out of the $20,000 the agent is authorized to make the purchases of farm implements, &c.?—A. Occasionally, though not as a rule.

Q. What number of employés are there at the agency?—A. The school is let by contract.

EMPLOYÉS AT INDIAN AGENCIES.

Q. What are the other civil employés?—A. The physician gets $1,200 a year, and a clerk receives $1,200 a year; the blacksmith receives $1,000 a year, and the carpenter gets $900 a year; a farmer, $900, and the assistant farmer at $720 dollars, I believe; I think it is $60 or $62 a month, but I am satisfied that it is that much; then there is an issue clerk.

Q. What does he get?—A. Sixty dollars a month. Then there is a night watch at present, that was only temporary at the time the annuities are there; he gets $50 a month.

Q. You have a physician?—A. I spoke of a physician at $1,200; then there is a laborer at $300.

Q. That constitutes the officers of the agency?—A. I believe it does, if I have not omitted any.

By Mr. BOONE:

Q. Is there not a miller?—A. No, sir; we have an engineer and a miller together—the treaty provides for an engineer and miller—but Congress was very wise in providing last year that that fund could be expended at the discretion of the Secretary of the Interior, so that we now consolidate a miller and an engineer together.

By the CHAIRMAN:

Q. One supplies the two places, and he gets $900?—A. Yes, sir.

By Mr. HOOKER:

Q. These employés are paid out of the $20,000 annuity?—A. No, sir; that is a provision of the treaty; that is all except those who are in charge of the commissary department. The treaty provides for a physician, teacher, farmer, blacksmith, engineer, and miller.

Q. Out of what fund are they paid?—A. I think about $6,000 is appropriated annually for the pay of employés.

Q. At that agency?—A. Yes, sir; and if we go beyond that we use ot the substance of the fund in caring for the subsistence stores.

Q. It is a consolidated agency?—A. No, sir; both tribes have always been recognized as being together.

EDUCATION.

Q. The school is by contract?—A. Yes, sir.

Q. Who is the contractor?—A. John H. Seger.

Q. What does he get?—A. Three dollars and fifty cents per scholar per month; then he furnishes his own employés. The government furnishes all the material, and he furnishes the help.

Q. It is a manual-labor school?—A. Yes, sir.

Q. They are formulated at the school building?—A. Yes, sir.

CHEYENNE OUTBREAK.

Q. Now, in reference to the outbreak of a portion of the Cheyennes, of Dull Knife's band, you say you gave notice to the military commander of the fort adjacent on the fifth of September?—A. Yes, sir.

Q. To keep watch of those Indians, because you were afraid they were going to break away from the agency?—A. Yes, sir.

Q. And he did, in accordance with your request, place companies to watch them?—A. Yes, sir.

Q. Then the movements of the military on the 5th, and the pursuit of

them when you notified them they were actually gone, was made at your instance?—A. Yes, sir.

Q. And upon your application as agent at the post?—A. My first official request for troops was on the morning of the 10th at three o'clock. I did it simply as a matter of courtesy and as a matter of understanding, and I did not withhold any plans from the commanding officer. We got along very well.

Q. You did notify him, and the pursuit and the subsequent fight was in consequence of your request?—A. Undoubtedly.

Q. I understood you to state, when he overtook the Indians a scout went among them to request their return?—A. I have not seen the officer since, but I have heard through other persons that he did that.

Q. They declined to return?—A. Yes, sir.

Q. And prepared to resist, and he had to resort to force to compel them?—A. Yes, sir.

Q. And was repulsed by the Indians?—A. Yes, sir.

Q. And the subsequent pursuit of them and two other battles were made by the military in accordance with the request by you to return these Indians to the reservation?—A. I suppose they acted after that under the instructions of General Pope.

Q. When the military is called in they are called in for the particular purpose of forcing those Indians to return to the reservation?—A. Yes, sir; the treaty provided that that was their land.

AS TO PURCHASING AGRICULTURAL IMPLEMENTS.

Q. In point of fact, how much of this appropriation is appropriated for farming implements?—A. As I understand, the treaty is intended for any beneficial work.

Q. How much in point of fact is spent annually for these tribes for agricultural implements?—A. I cannot make a statement.

Q. What is the character of the agricultural implements which they receive?—A. Plows. We have only had funds within the last year, enough to buy any amount of agricultural implements.

Q. What is the extent of the reservation?—A. I do not know exactly; they are on the reservation by executive order, and it is not their treaty reservation.

Q. Approximate it.—A. It is over a hundred miles in length.

Q. What is the extent of land actually under cultivation?—A. About 500 acres.

Q. That constitutes the whole of the Territory that is under cultivation?—A. Yes, sir.

Q. Does that include the farm worked by the pupils?—A. No, sir.

Q. Including that how much is there?—A. About 600 acres.

Q. Then they have a farm of about 100 acres?—A. One hundred and twenty acres.

Q. And the balance of the Territory cultivated amounts to abont 500 acres?—A. Yes, sir.

Q. And whatever agricultural products they raise comes from these 600 acres?—A. Yes, sir.

Q. I want to know what amount of money was expended for agricultural implements last year?—A. By reference to the office file I could tell.

Q. Do you mean to say that an officer of the Army, a man of discretion and judgment assigned to the duty of Indian agent, at your agency for instance, that this character of officers would stand in the way either of the advancement of the Indians in agricultural pursuits, or civiliza-

tion or religion?—A. It would depend entirely upon who the Army officer was.

Q. A man of broad mind and views who had the interest of the Indians at heart; would he not be as capable, if assigned to do this work, as a civilian?—A. If he was left to exercise his own judgment without being hampered with regulations, and things of that kind.

Q. Do you mean to imply that there would be a disposition on the part of the superior to hamper him with regulations?—A. I only speak of what I observe of their manner of conducting affairs.

Q. They have a pretty rigid accountability?—A. Yes, sir.

Q. You do not mean to say that an Army officer possessing like qualifications for this business as yourself I will say, as you are their agent, might not do just as capable and efficient work as you are doing?—A. I would have to make that difference; if he was relieved from the Army regulations he might do so.

Q. You are acting as a subordinate, are you not?—A. Yes, sir; but still a great deal of discretion is necessary with a civilian officer that would not be in the Army.

Q. What discretion is confided to you under the regulations of the Interior Department that might not be confided to a military officer under the regulations of the War Department?—A. In the actual details a great many minor circumstances at an Indian agency, many things which I cannot bring to mind just now. But I know Army officers who have been put in charge of Indians and who have been successful, have attributed their success to the fact that they were not restricted by the Army.

Q. While Army officers?—A. Yes, sir.

INDIANS WORK VOLUNTARILY.

By Mr. SCALES:

Q. Is the work done by Indians on these farms voluntary?—A. Yes, sir. We also in connection with our Indians, have allowed the Indians to transport their own supplies from the railway station to the agency.

Q. If they were compelled to work so many hours a day, how would that be?—A. Some of them might be compelled to, but it would not work with a band like Dull Knife's, unless by an actual overpowering force.

Q. Could you compel even Dull Knife's band to work so many hours a day?—A. I would not like to put it in the light of compulsory labor with them. In regard to the employés at my agency, I do not employ any man who is not specially adapted to the work.

By Mr. HOOKER:

Q. How long have you been there?—A. Six years last June.

Q. You set an example to the Indians to cultivate the soil?—A. Yes, sir.

Q. How is it that you have not prepared them to fill any of these offices?—A. I have.

Q. You have never made an engineer, miller, or mechanic out of any of them?—A. Some are in the course of education.

Q. In these six years you have not preferred any of them to the whites for these positions?—A. In connection with the school we have directed their attention to other pursuits than those. We have got them forty wagons, and are letting them transport their own supplies, and they have made some advancement in many other respects. We have our herders, and I forgot to mention that in my statement; our herders are all Indians.

THE INDIANS TAKE TO GRAZING.

Q. Do they take readily to that?—A. Yes, sir.

Q. They take more to that than to cultivating the soil?—A. The natural adaptation of the country and climate is for grazing; it is better adapted for that than for anything else.

WASHINGTON, D. C., *December* 7, 1878.

ALFRED B. MEACHAM sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. In Washington City.

Q. What is your business?—A. I am publisher of a paper called The Council Fire—a paper devoted entirely and exclusively to the Indian question.

Q. We want to ascertain whether it would not be proper to make the change from the civil to the military service—from the Interior to the War Department. What do you know bearing upon this question? You have had some personal knowledge, I believe—or does your knowledge reflect only the view of others?—A. What I propose to say is what I have seen with my own eyes, and heard with my own ears, from an experience beginning in 1844, and almost unbroken from that time to the present.

Q. What relation did you sustain in 1844?—A. That was the time in which the Sacs and Foxes were removed from Iowa and the Western country. From that time until 1869 as a citizen and miner and trader and business man.

Q. The Indians were then managed as they are, to some extent, now?—A. No; in 1844 the Indian service reported to the War Department.

Q. When did your knowledge specifically begin?—A. In 1863. I was then located in business on the borders of the Umatilla Reservation in Oregon. From 1869 to 1872 I was superintendent of Indian affairs for Oregon. In 1873 I was appointed chairman of the Modoc peace commission, and was with General Canby and Doctor Thomas when they were killed. Since that time I have had no official relation to the government.

THE TRANSFER SHOULD NOT BE MADE.

Q. From your experience, do you think that it would better the condition of the Indians and be more economical and wise for the government to make the change?—A. I think not, for these reasons: I have devoted all my life to this Indian question. I have suffered as much as any man could suffer on account of the "dual management," so called, of Indian affairs. I am still an invalid from the effect of Modoc wounds that I got in my body at the time of General Canby's death. From that time I have given my voice and my brain and all my powers in doing what I could to make public sentiment in favor of justice and the fulfillment of treaty obligations with the Indians as the solution of the problem of their management, and I am truly convinced, after all my experience, that the only solution lies in the Indian becoming a civilized man and finally a citizen. There is no other way. I think there can be no permanent peace until that plan is firmly established.

CAUSES OF THE MODOC OUTBREAK.

Q. Do I understand you to justify the attack made on your life and also the killing of General Canby by the Modoc Indians; had they any

proper justification for that deed?—A. I would not like to say that they had; only this: We set them the example; they were not the first to inaugurate that act of treachery. We pledged the nation's faith that we would do no hostile act pending the negotiation for peace, and in the face of this promise we did move our soldiers twenty miles nearer the Modocs, and we suffered their horses to be captured, and when they demanded their return, it was not done. I was acting as chairman of the peace commission to the Modocs at that time, and General Canby was acting on the part of the Army. General Canby was sent to the front from the Department of the Columbia, at Portland, Oreg., at my special request before leaving Washington. I met him at the Warm Springs camp, about twenty-five miles from the Modocs; and by his consent we established an armistice to bring about a cessation of hostilities, the Modocs assenting to the proposition.

Q. Is it your opinion that if the government had carried out its agreement with the Indians strictly there would have been any cause for the Modoc war?—A. My opinion is that if the government had fulfilled the contract with Captain Jack according to the treaty he would have remained on the reservation, as he was pledged to do. If we had fulfilled our promise and had not moved our Army or suffered their horses to be captured, there would not have been any assassination, and the peace commission would have been a success, instead of a failure.

THE PRESENCE OF THE MILITARY NECESSARY IN SOME INSTANCES.

Q. Do you think there are any Indians now that really ought to be managed by the military, or is it your opinion that the Indians could be managed by the civil authority?—A. Well, sir, I think there are some Indians that would require the presence of military forces. I think that of the two hundred and sixty-five thousand Indians, there might possibly be one hundred thousand that ought for a few years longer to be aware of the presence of military forces. For the remainder, I am fully persuaded that they would be better off if there were no soldiers within a thousand miles of them; the country would be safer. If there had been no soldiers in the Klamath and Modoc country, there would have been no war, no bloodshed. The removal of the soldiers from the Warm Springs gave Captain Smith and Agent Wilbur an opportunity to demonstrate, as they have done, that Indians can be managed without soldiers.

Q. Do you consider the Indians under Wilbur as being among the peaceable Indians, and that it is safe for white men on his reservation?—A. The Takèmaw Indians proper I consider as peaceable as the citizens of Washington City without a police force. There are Indian tribes said to belong to the Yakama Reservation by treaty not upon the reservation who are inflammable, and who have been driven about by the white settlers; but those upon the reservation do not require a police force other than the Indian police. I am satisfied of that.

Q. How long have you been acquainted with that agency?—A. I have been living in that country since 1865; with the Indians and with the agent, incidentally, nearly all the time since.

INDIANS AT THE YAKAMA AGENCY ADVANCING IN CIVILIZATION.

Q. During that time, do you think they have made any considerable progress towards civilization?—A. I am sure they have; I have no doubt in my mind, from what I have seen of the Indians and from representations made by Mr. Wilbur and others. Of course I have not been present during all these years; but I know that he has his wagon-shop,

and harness-shop, and blacksmith-shop, and saw-mill, and shingle-machine, with all these industries running without the aid of more than two white men; and that he has a man making horseshoes, and shoeing horses, and mending boots and harness that were a little while ago Indian boys—eighteen years ago. I have no doubt of it. I am positively certain of it. And the same thing is true of the Warm Springs Indians, under Captain John Smith, on the south side of the Columbia River. I have visited that reservation officially a number of times, and I knew them when they were debased, and demoralized, and perhaps as low a specimen of the Indian as could be found on the Pacific coast; and I have visited them when they had their schools, and their churches, and their cultivated farms, and when they dressed like white men, and had scarcely a blanket Indian among them.

Q. You seem to be acquainted with the Umatillas; will you tell the committee what situation they were in when you last knew them, and how long it has been since you have seen the Umatillas?—A. I have not seen the Umatillas for three years.

Q. Up to that time you found them getting along well; and do you consider them among the peaceably-disposed Indians?—A. I was connected with a very enterprising and active business located within a mile and a half of the border, and have been since 1863, and I have had to do with thousands of dollars of purchases of horses and cattle and hay and oats and vegetables, and I have never had a difficulty or a misunderstanding with an Indian in my life; have never had occasion to lock a door; never had a cause for fear. There is a disturbing element in the wild Indians who are out upon the reservation that sometimes may give trouble; but that is not the case with those upon the reservation. There are three classes of Indians on the reservation proper: the Protestants, the Catholics, and the Dreamers. The christianized Indians give no trouble; the Dreamers are turbulent.

INDIANS PEACEABLE AT THE UMATILLA RESERVATION.

Q Is that a band?—A. No; the Dreamers are a religious sect founded by a prophet. The Indians of Umatilla have given no cause of offense. As a people, under all circumstances they have been peaceful. They occupy a beautiful country. As I have said, there are three classes among them, and they do not harmonize very well—the Catholics, the Protestants, and the Dreamers—at leastt here is a little spirit of rivalry among them. The Catholics and Protestants are perfectly peaceable. They are rich, and wealthy in horses, and have made some progress in civilization. The others are Dreamers. The religion of the Dreamer is, in my judgment, founded upon a partial understanding of the doctrines of Christianity in regard to the second coming of Christ. They expect a Savior to come—a Savior, a Redeemer, a Deliverer—from their own race. Joseph, the Nez Percé chief, is a Dreamer. I visited Smohallow, or Big Dreamer, and he and his Dreamers are in favor of disposing of the reservation in ten years. The Christian Indians have been opposed to this.

In 1871, I was ordered by the department to consult wth these people in regard to settling their lands. There was a division of sentiment then, a majority opposing the sale.

The Umatilla Indians are peaceably disposed; are in the line of commerce on the great thoroughfare; and it would seem impossible that they should continue their relation to society as blanket Indians any longer.

WHITES DESIRE TO GET POSSESSION OF THEIR LANDS.

Q. Is there not a great anxiety on the part of white people to get them out and to get possession of their reserve?—A. There is.

Q. And sometimes give annoyance to these people?—A. Yes; a great deal of annoyance.

Q. Their lands are very valuable, I believe?—A. Yes. A San Francisco firm has, to my knowledge, offered $10 an acre for one hundred thousand acres in a body. It is located in the warm climatic lines, where the snow falls both sides, and remains on the Umatilla reservation but a small portion of the year, and the stock lives without feeding, and makes it a most desirable place from that fact.

Q. How many of them are there?—A. About nine hundred when I was superintendent of Indian affairs.

Q. They confine themselves mostly to stock-raising, I believe?—A. Yes; they are not much given to farming.

Q. But the country is good enough for farming purposes, is it not?—A. O, yes, sir.

REASONS FOR OPPOSING THE TRANSFER.

Q. Why do you think it would be better to have the Indians managed by the civil department of the government? What objection do you raise to their being placed under the military? Do you think that they would be more overbearing and less attentive to their wants and their needs, or is there any other reason you can give?—A. I think there are three reasons I can give for my view on this question. In the first place, the Indian considers the soldier to be his enemy. Friendly relations are not natural between the Indian and the soldier, to begin with. In the second place, if the Indian is to be saved, it is as a civilized, not a war-like, man. If he is to be saved as a civilian, and to be made a part of the Government of the United States, he must be taught civil law; his institutions must be of a civil character. The government of the military would have to the Indian the Army tone, the tone of authority, which would be very grinding and uncomfortable to the Indian, who is high spirited; and if the change should be made, the whole nature of the service would necessarily partake more or less of the nature of the military arm of the government service.

CAUSES OF THE TROUBLES WITH THE INDIANS.

Q. Do you think that most of the difficulties with the Indians grow out of the failure to comply with contracts and not fulfilling pledges made with the Indians—that is, agreements; not only treaties, but other agreements?—A. I have never known, in twenty-five years, a difficulty between a white man and an Indian that has not arisen from some misunderstanding of treaty or other compact; not one.

Q. Would you have any other objection to the Army except that the Indians consider them their enemy?—A. Yes, sir; I have another, a third, objection to it. The Indian must be taught the forms and usages of civilization, and the Army man does not teach him these. He cannot do it. It is not his business. To be a successful teacher of anything, a man must be himself educated in what he would teach. The Indian generally is a ductile and imitative man. He adopts the habits of those around him almost always. You can generally tell the character of the Indian agent by the Indians under him. If they are to a large degree drinking men, the Indians become drinking men invariably. Put sober men over them, and you will scarcely ever find a drunken Indian. If a man is sober himself, and is surrounded by such influences, the Indians

will, to a greater or less extent, follow his example. I think that if the Indians are to become civilized men, they ought to be educated by civil men and not by military men.

The Indian must be taught to labor; but as long as we feed him without labor on his part, we must fight him. There can be nothing but alternate peace and war as long as we continue to feed the Indian and do not teach him to labor.

INDIANS CAN BE TAUGHT TO LABOR.

Q. You think it possible to teach him to labor; that if the proper instruction is given him he will take to work, do you?—A. Well, when I see a whole community of people breaking the ground, and making fences, and cultivating their little orchards, and sowing the seed, and reaping and thrashing the crops without the aid of white men, who were once Indians in blankets and knew nothing whatever of agriculture, I say that there is no mistake about their being capable of instruction in work, and of their taking to it. I know it. They nearly all recognize the fact that they must change their mode of life. I think that is scarcely disputed among them. But their complaint is, that they are driven from pillar to post, and have no resting-place, no abiding home, and no faith in the promises of the government; this is the great drawback to their civilization, to their adopting the habits of civilized life.

AS TO CONSOLIDATING ON FEWER RESERVATIONS.

Q. Do you think it better to let them remain on the reservations scattered as they are now, or would it not in your judgment be better for the Indians if they were consolidated and brought nearer together, and to have fewer agencies?—A. I think a general rule would be an impracticable rule. I think there are instances, and some might be named where the Indians should have the land upon which they have lived, and which they have cultivated for twenty years, on which they have built their cabins, and to which their attachments are so strong; it would be better in some such cases to allow them to remain and to take their place as citizens when they are ready for it. There are other Indians that are not attached to the soil, wandering nomads, who should be gathered together where they can be controlled. But the Warm Springs in Oregon, who have their little homes, if they could only have an assurance of a permanent title to them, I do not think ought to be disturbed. I think it would be a crime or a mistake, at least, on the part of the government, to change the latitude or the climate of any of the Indian races very materially, as for instance, to take the mountain Indians to the plains, or the Indians of the plains to the mountains, the Southern Indians to the northern climates. To do this would be disastrous.

By Mr. McCREERY:

Q. How many Indians are on Wilbur's reservation?—A. About three thousand six hundred, as reported by him.

Q. How many acres do they have under cultivation?—A. I think about forty-five hundred acres, as he reports; I believe that is the number. I am not sure. I have not the figures before me. They claim to have built forty-five miles of board fence since they started their sawmill.

Q. Is it your opinion that if the military took charge of Indian affairs they would not appoint such men as Wilbur to any place whatever—that they would be excluded from such positions?—A. No, sir; I do not think that that would follow necessarily, at all.

Q. I thought from the course of your remarks that you were of that opinion?—A. That depends entirely upon the act or the law; rather, the effect or construction of it would have something to do with it.

By Mr. BOONE:

Q. If a law should be framed transferring the Indians to the War Department, leaving it discretionary with the Secretary of War to appoint, where most suitable, civilians as agents, and where, in his judgment, it would be more suitable, Army officers, simply changing the place of accountability from the Interior to the War Department, and, as a matter of course, the methods of purchasing and distributing the Indian supplies, how could that in any way operate to the detriment of the Indians?—A. I think, if the Indians continued under the present forms, it would make very little difference; if they simply reported to the War Department, and no military rules were enforced upon the reservation, I cannot see that it would make very much difference.

Q. Is it not a fact that there are reservations now where the presence of the military is sometimes absolutely necessary?—A. Yes; in some places it is, I am satisfied.

NO MORE TROOPS NECESSARY IN THE EVENT OF A TRANSFER.

Q. Would it necessitate the presence of troops where they are not now stationed, simply because a military officer was agent in place of a civilian?—A. No, sir; I do not believe it would.

Q. Now you say, and it is true no doubt, that a man to teach anything must understand what he would teach; is it your opinion that the military officers of the country know nothing about civil management?—A. That is not my opinion; nevertheless, they are educated to war; that is their profession, and the usages of military life give character and tone to everything the military man does; and I am of the opinion that the influence would be bad, because the Indian would consider it as an abandonment of the peace policy.

Q. Well, because a man is educated as a military man, and is therefore, as you say, educated to the profession of war, is that any reason why he should desire war more than other men?—A. No, sir.

Q. Is it not, rather, a reason why he should avoid it, understanding very well that he would be involved in it?—A. Well, that depends very much upon the nature of the man.

Q. Well, if the management of this question was in the hands of the War Department, and sensible, discreet, experienced men, even though they may have been bred to arms and educated in military life, were made agents in the place of civilians, is there any reason why they could not control and govern the Indians as well as civilians?—A. Yes, sir; because they are not apt to be practical men. You cannot make a West Point man a farmer or a builder. He cannot show the Indian how to build his cabin, or break the ground, and lay down a fence-worm.

CAUSES OF FAILURE OF CIVIL ADMINISTRATION.

Q. Is not that also true in a great number of instances of the civil agents that are appointed by the Interior Department; have they not been taken from the mercantile pursuits, and professional pursuits, and other pursuits than farming and house-building?—A. Yes, sir; and therein has been the cause of more failures in the civil service of the Indian management than any other cause. Failure has often resulted simply because the civil service here has not always been practiced.

Q. Is it not true, as that service is now managed, that they have to

employ besides the agents, farmers, and millers, and mechanics, and carpenters, and blacksmiths, and machinists, and so on, in the agencies?—A. Yes, sir; they do.

Q. Well, it is the business of these men to teach the Indians and to assist in these professions in which they are employed, is it not?—A. Yes, sir; it is.

Q. Now, if that is true, and these men were still to continue in the employ of the government, for this purpose, would there be anything in the fact that the agent himself was a military officer to retard these men in their operations?—A. Well, I suppose, sir, that there would not be, substantially, or really, but the Indians would not discriminate in the matter. A military man is always an objection to the Indian, and a military ruler in time of peace is an objection.

Q. Well, is that true, as a rule, that the Indians are opposed to military men?—A. I have never found an Indian, in my life, that wanted a soldier as an agent.

SOLDIERS AS AGENTS NOT THE CHOICE OF THE INDIANS.

Q. There have been soldiers as agents, have there not? Is it your experience that they have been objectionable?—A. Yes, sir; there have been military officers in that position, but they were not the Indians' choice. There were four military men as agents during my administration, not West Point officers, but volunteer army officers.

Q. How did they manage affairs?—A. I think two of them made good average agents. One of them, especially, took very great interest in his work; he was a civilian until the late war, and educated to farm life. He took an active interest in his duties; was a very religious man, and sober man, and maintained good order and discipline, and was a commendable agent. I had no difficulty with him as superintendent. I agree with you, that if the right men could be selected from the Army for the Indian service, that the service could be performed by the Army. I believe that is true. At the same time, the objections I have stated would remain.

Q. Now seeing it is true that there must necessarily be soldiers near some if not most of the reservations, and that they are frequently called upon to aid the agents in enforcing order and discipline, there is in this state of things something of a dual accountability, is there not?—A. Well, there need not be.

Q. But is there not? That is to say, in those agencies where soldiers are necessary, and where they have civil agents, is not the military part of it accountable to the War Department and the civil part of it to the Interior Department? That is what I mean by dual accountability. Now does not that sometimes produce trouble and confusion?—A. It does.

Q. Then there ought to be something done by which there should be a single accountability and responsibility, should there not?—A. I think that is right, there should be.

MILITARY AT PRESENT SIMPLY A POLICE FORCE.

Q. Now, if soldiers are sometimes and frequently necessary, how is it possible to have this single accountability, unless you place that accountability in the War Office?—A. They should be amenable to the War Office; but my practical experience with General Canby and with General Crook, while superintendent of Indian affairs, was this—and they so construed the law—that they were present simply as a police force, never to interfere. Neither General Canby nor General Crook ever sought to interfere on Indian matters. And that I understand to be the

intention and real spirit of the military force in the Indian country—that they are there only to assist the agent when called upon.

Q. You made the remark, a while ago, that if the agent over the Indians was a drinking man, the Indians were likely to become drunkards?—A. That would be the rule; yes, sir.

Q. Well, you did not mean to say that all Army officers were drinking men or drunkards?—A. No, sir; I simply said that they would be apt to follow the example of their officer. A good, sober, pious man—a religious man—whether a civilian or a military officer, would be likely to have his Indians become of like character; that is all I meant to convey by my remark.

Q. Then what we want, in your opinion, is good, honest, sober, capable men as agents, wherever they may be found; and whenever you get men of that character, no difference what their profession or pursuit in life may be, you get a good agent. Is that your view of the matter?—A. Yes, sir; if a good man puts his heart in the work, he may make his work a success with the Indians.

Q. Have you heard any complaints about the want of supplies or about the character of the supplies, as furnished by the Indian Department?—A. Only from newspaper reports.

Q. You know of no unfaithfulness or defalcations on the part of any agents?—A. Not of my knowledge; I have heard rumors.

INDIANS NEED PROTECTION MORE THAN ANYTHING ELSE.

Q. Well, seeing the manner in which our Indians are now surrounded, is it not a fact that they need protection more than anything else, just now?—A. Yes, sir; they need protection worse than anything else.

Q. Is it not a very common thing around agencies, where the Indians are located upon desirable lands, that speculators and avaricious white men are making all sorts of efforts to get possession of their country; and does not a great deal of the trouble we are put to, arise from that fact?—A. I think it does; that is correct, according to my observation.

AS TO DIVIDING LANDS IN SEVERALTY.

Q. What do you think of the proposition made in some localities to give the lands of the Indians to them in severalty—with some restrictions, of course?—A. Well, I think as to that, as I expressed myself on the matter of consolidation, there are some reservations where it ought to be done immediately; they are ready to receive it. There are other cases where it would not be desirable. The people of the Indian Territory are opposed to the allotment of their lands in severalty.

Q. Well, you said that the Indians were likely to adopt the habits of those around them; now I understand that they are opposed to giving up their traditional habits; why do those living near these white men not give up their blankets and adopt the citizens' dress?—A. That is not so strange when you think of it. The Indian is a boy, a novice, and when he comes forward in civilization, and is trying to be a man, he is outwitted and driven back and repelled, and bewildered by one man's telling him that schools are a good thing, and Christianity is a good thing, and another telling him that they are bad things; and by one telling him that whisky is bad, while another offers him the bottle. He becomes confused by the different opinions and practices of white men, and does not understand him in his Christianizing policy.

Q. That has not been the custom in the agencies, has it?—A. No, sir; not upon the reservations. There have been no drunkards upon the reservation.

Q. How do you account for the fact that the Omaha Indians are wearing blankets, and some of them are living in their tepees, in preference to the houses built for them by the government?—A. I think, perhaps, it is because the proper influences are not brought to bear upon them. Ten years ago there was not a single man of the Warm Spring Indians that did not wear the blanket; not one is wearing the blanket to-day. Four hundred men dropped off their long hair, put on hats and flung aside their blankets, putting on citizens' clothing, in a single day. It was a transformation.

Q. How many reservations of Indians are there in California to-day?—A. I do not know.

Q. Are you acquainted with the condition of the Indians on the Pacific coast, especially in California? A great number of these Indians, I understand, are off their reservations and scattered through the country, laboring like other men?—A. I think that is true.

Q. Now what do you think of the policy of keeping them on reservations after they have this desire to work for their support?—A. As superintendent of Indian affairs I always encouraged the idea of the Indians working with the white men, because every white man thus becomes a teacher. The Warm Spring Indians owe their advancement largely to this fact.

By Mr. HOOKER:

Q. What was your first position in the Indian service?—A. First as superintendent of Indian affairs in Oregon, afterward as special commissioner.

Q. Are you connected with the Indian Bureau at present?—A. No, sir.

Q. What was the extent of your jurisdiction in Oregon? How many tribes had you under your care?—A. The Oregon tribes had seven reservations, which included thirty different bands or tribes.

Q. And you were superintendent of these?—A. Yes, sir.

Q. What was the period of your administration?—A. From 1869 to 1872.

Q. Have you held any position since 1872 in connection with the Indian Bureau?—A. I was special commissioner to the Modocs.

Q. When was that?—A. The appointment was made on the 20th of February, 1873, for a special purpose, extending over a period of 90 or 100 days.

Q. Was that prior to their removal to the Indian Territory, or afterward?—A. Before, during the Modoc war; it was an effort to make peace.

Q. How long did you hold that position?—A. I have not the exact data with me.

Q. Can you not give me the approximate time?—A. The 11th of April terminated the labors of the commission. After recovering sufficiently from the wounds I received—it was something like four or five months—I came here.

Q. You were superintendent for three years of the Indians in Oregon?—A. Yes, sir.

Q. By whom were you appointed?—A. By President Grant.

Q. What salary was paid you?—A. Twenty-five hundred dollars.

Q. What bonds did you give?—A. One hundred thousand dollars.

Q. As such, you had supervision of the Oregon Indians?—A. The Oregon Indians only.

BAD FAITH THE CAUSE OF TROUBLES WITH THE INDIANS.

Q. I understood you to say that in your experience most of the troubles had grown out of the violation by the government of its treaty stipulations with the Indians, or of the promises made to them by the agents of the government?—A. Almost always; I may say invariably.

Q. When you speak of the promises made by agents of the government, to whom do you refer?—A. I refer to the promises made in the treaty and of the failure of the agents to fulfill them.

INDIANS OF THE INDIAN TERRITORY OPPOSED TO ALLOTMENT OF LANDS IN SEVERALTY.

Q. This has been the main cause of our Indian wars?—A. I think so.

Q. In reference to the discontinuance of the tribal relations and the amalgamation of the Indians into the population of the United States, do I understand you to say that you found the Indians in the Indian Territory opposed to it?—A. I find the Indians oppose the allotment of their lands at the present time.

Q. What is your opinion of the question of the division of the lands into severalty? If it should be done, how long do you think the Indians would hold it?—A. Do you mean with no restrictions?

Q. Yes, without restrictions.—A. Well, sir, in five years there would not be more than one in five, and in ten years perhaps not one in ten, of them would have a foothold or be in possession of any land whatever. The cunning and avarice of the white man would dispossess them.

TRIBAL RELATIONS SHOULD BE ABANDONED.

Q. Then do you not think that their salvation consists in their maintaining their tribal relations and the government fulfilling its treaty stipulations with them and their keeping their land in common?—A. No, sir; their tribal relations should be abandoned, but not at once; not abruptly by a single act. It will require a long training to bring them up to that point. I believe that the end to be aimed at is their civilization and citizenship with all their privileges and rights, but I do not believe they are yet ready to receive all these.

Q. None of them; not even the civilized Indians?—A. There are not a thousand men, even in the Indian Territory, that can hold their own with the white men.

Q. Do you not think that the five civilized tribes occupying in the main the Indian Territory have among them men of education and intelligence, and who are perfectly capable of knowing their rights and conducting their affairs?—A. Yes, sir; there are a few such men.

Q. Their leading men are generally of that character?—A. Not always the leading men; the strongest men there are not always to the front, and that is the case in civilized life, too, sometimes.

Q. But you think in the main there is sufficient intelligence to look after their own affairs, taking them as a body, and competent with their own form of government to take care of themselves?—A. Some of them still need the agent to consult with them, the Seminoles and Creeks especially.

COURTS SHOULD BE ESTABLISHED FOR THE INDIANS.

Q. Suppose the government should establish courts in the Indian Territory to adjudicate upon the offenses committed by and against the Indians, giving them trial by jury of their own people, do you not think that that would be a remedy, so far as the government is concerned, for

many of the troubles that arise?—A. I think it would advance the people very much; it is very much needed.

By Mr. BOONE:

Q. You were present at the tragedy of the lava-beds?—A. Yes, sir; I was.

CAUSES OF THE MODOC MASSACRE.

Q. As a commissioner appointed by the government to make some agreement with these Indians?—A. Yes, sir.

Q. Your statement left the impression on my mind that the conduct of the Army officers was the cause of the massacre that took place there—unfaithfulness to their promise, in moving the soldiers up; how was that?—A. Well, sir, I think I made the statement of fact in this way: General Canby was in command of the Army, by order of the Secretary of the Interior. I was there representing the civil service by way of co-operation. We tendered to the Modocs a proposition that no hostile act should be committed on our part if none was committed on theirs. They accepted it by saying, "We will not fire the first shot." There was no writing on either part. The tender of the armistice was made. They accepted it. They kept it to the letter. We did not. A company of cavalry passing from one military camp to another drove off some Modoc horses. We refused to give them up.

Q. There was an agreement that you should meet and have a conversation with Captain Jack and some of his men?—A. Yes, sir.

Q. Now before the soldiers moved up nearer to the lava-beds, did you not have information, through an Indian, perhaps Boston Charley, that the agreement upon the part of the Modocs would not be kept; and was not that the cause and the reason why the soldiers were moved up?—A. No, sir; we did not have an intimation of any intended treachery on the part of the Indians until after the soldiers were moved down to the lava-beds. There never was a proposition to commit an act of treachery until after we refused to give up their horses. It was a mistake, I think, in not returning them. After the peace commission had come within two miles of the camp, then we were notified by a Modoc woman acting as interpreter—notified by her that unless the horses were returned and the soldiers removed back to their original camping ground, that we could not hold our council in safety. We had a fair warning. After that warning, I had a long conversation with a Modoc chief, not in the presence of Army officers, but with two civilians with me, and five or six days later the proposition was made to meet them under a flag of truce.

Q. Well, they fired upon you before you fired upon them?—A. Yes, sir; on this occasion.

Q. You were wounded yourself?—A. I caught about seven bullets.

E. A. HAYT, Commissioner of Indian Affairs, sworn and examined.

By Senator MCCREERY:

Question. You are aware, perhaps, of the object of this committee?—Answer. Yes, sir.

After the full statement made by the Secretary of the Interior there remains but here and there some facts which he did not touch upon pertinent to this question, which I wish to present to you to-day. I will endeavor to be brief. My remarks may be somewhat desultory, as I simply wish to touch a few points—the Secretary having presented to you the strong and salient points—and take up a few questions that he did not fully discuss and go over them.

COST OF TRANSPORTATION UNDER THE TWO SYSTEMS.

This question of the transfer is urged on various grounds. On the ground of economy, however, I find that a good many people think that it would be advantageous to transfer the service to the War Department; but in my judgment their view proceeds entirely from a mistake as to the facts. I am thoroughly satisfied that the Indian Bureau, as at present organized, is doing its business for the government more economically and thoroughly than the business of the War Department is done. This can be illustrated only by referring to certain things that occur almost daily in the office. On the question of transportation, for instance, you have been told that the Army transportation amounts to $4,000,000 a year. It seems to be an enormous sum to pay for transportation, and by the tonnage transported it seems almost incredible that such an amount can actually have been paid. I have sent to the War Department for information as to the number of tons of freight moved and number of miles over which they were moved, but I have not been able to get an answer to that question, and therefore I cannot tell you whether the sum of $4,000,000 is excessive or not; but it seems to me that it is an enormous amount to pay for transportation.

The transportation paid by the Indian Bureau for the current year for 1,062 tons of freight, moved from the Atlantic coast to the Missouri River, was, in the aggregate, $13,875; or, it is carried at the rate of sixty-five and twenty-nine hundredths (65.29) cents per hundred pounds from the seaboard to the Missouri River. If the Army freight had been carried at the same rate it would have been almost impossible to roll up such an amount for transportation as General Meigs said was paid, and that is exclusive of the wagon and mule transportation which the Army uses within its limits and owns. I am told by transportation contractors, and the matter is susceptible of proof, that the Army transports goods at the current rates to everybody fixed by the railroads, and with classifications of freight which doubles the cost. You are aware that there are first, second, third, and fourth classes of freight, and that each class has a different price. I telegraphed to New York for the classification and price paid by the Army, but have not received it this morning to present to you. But the very fact that they do transport their freight at the rates current from the seaboard to the Missouri River, and under classification, enhances its cost very much indeed.

On the Missouri River our freight compares with Army freight very favorably. Now our whole transportation for the Indian service for the year preceding this current year was $219,000. For this current year it will not exceed $225,000; and, as I have shown you, we have carried over 1,062 tons of freight from the seaboard.

On the purchase of supplies, we can make a comparison between the Army purchases and ours (and this argument is addressed to the one question of economy, because that is the question so largely discussed just now by the public, and because we hear of it so often in the prosecution of our business). Now during the last fiscal year, if the Army had purchased our beef and flour at the price they paid for their own beef and flour, it would have cost the government $650,000 more than it did cost as purchased by the Indian Bureau. On beef alone, this year, as the Secretary showed you yesterday, we are $1.40 a hundred below the average price paid by the Army for beef, and that, on our purchase of beef alone, would amount to $644,000. These are the two leading points at which you can test the comparative economy of the two branches of the public service.

THE MANNER OF TAKING THE CENSUS OF THE INDIANS.

By Mr. HOOKER:

Q. Does the $644,000 include flour?—A. No, sir; beef only.

In this connection I wish to explain the paper presented by the Secretary to you yesterday, which without explanation would seem to be irrelevant to the case. You were asking whether we had an actual count of the Indians. We have adopted a system which not only gives an actual count, but we have registered the various families of the various Indian tribes, including the number of persons in the family. This is what we call a weekly issue certificate [showing a schedule]. These certificates the agent is now required to forward to the bureau every week. It had been the custom to allow them to retain the blanks formerly used (which in comparison were not specific) in their hands for three or six months sometimes; so that if any exigency compelled an agent to alter the amount issued it was within his power to do so, and the alteration could not be detected. Now the sending of a paper of this kind to the bureau every week, with the statement of four persons as to the issues therein contained—that they were present and saw the goods or supplies distributed to the Indians—closes the door to alteration and prevents fraud that was possible before this regulation was adopted.

The Secretary yesterday very briefly alluded to the want of system that formerly prevailed in the War Department in the matter of the land interests of the Indians—that no regular books were kept; that papers were sent in loose with statements and sometimes with marginal notes. The lands owned by the Indians embrace 151,000,000 acres. The care and oversight of these lands undoubtedly belongs logically to the Interior Department, and they are now cared for in the Indian Bureau of the Interior Department. We have a land division that keeps a record of all these lands, and when the Indians come to receive their lands in severalty, which they ultimately will, the keeping of these records will be found to be of great importance. We have a force now employed (which is very much overworked) in keeping these land matters accurately, so that the questions of conveyance, title, and all others that relate to the Indian lands which come to the office daily become matters of record. This land division would be as much out of place in the War Department as the infantry of the Army would be in the Interior Department.

HONESTY OF THE PRESENT INDIAN AGENTS.

Something has been said about the efficiency and honesty of the Indian agents. I am free to say that among the seventy-four agents at present in the government service there are as many capable and honest men, who have their whole heart in the work and are earnestly and faithfully striving to do it, as you will find engaged in any other vocation anywhere in the country. Of course, in speaking of the military officers of the government, I speak of them with a great deal of respect; but they were not educated for this business. I do not believe that preachers, as a rule, would make good Indian agents, because they are educated for another calling. We have, during the last year or year and a half, sought to obtain for the Indian service men educated for business pursuits—men who have a strong desire to do something to benefit the Indian service. The positions have not been given to politicians nor for political service; they have been given on the recommendations of the various religious bodies of the country and after a careful examination of the fitness of the applicant for the post. We

have found during the last year that a good many men were presented to us who were really not competent for duty as Indian agents, and of course such persons have not been appointed.

Now, I am thoroughly satisfied that the civil agents at present in charge of the Indians are, as a whole, honest and efficient. The reputation of Indian agents heretofore has been, of course, of a somewhat doubtful character—under the War Department and under the Interior Department. I do not propose for a moment to say that the service has been perfect in the past, but I do say that at present the service is as efficient, and I believe as well administered, as any other branch of the public service. The agents are doing a good work. You have had Mr. Wilbur before you. He is a man, you will admit, above the average man for this work. He is a man of superior ability. He has taken his Indians from a very low and degraded state and in a few years brought them up so that they are now taking care of themselves materially, and have become self-supporting, as far as the food support is concerned; they receive some annuities to which they are entitled. Now such men as Agent Wilbur are admirably adapted to their places in the service and the duties they are called on to discharge among the Indians. There are many other men who are quite as well qualified as Agent Wilbur, although there are few that have had as great experience as he has had in the service, and if all the questions of right and wrong involved in this transfer were put out of sight, I doubt very much if you could get as efficient a body of men selected from Army officers to take the Indian service as are in it to-day as our Indian agents.

RESULTS OF TRANSFER.

The Secretary yesterday spent considerable time on the question of the effect upon the Indians which would naturally arise as the result of the transfer. I am satisfied that the Indians would feel that the military government was a constant source of irritation. They are a brave and proud people. They are not a people that can be enslaved; and they would rebel against the arbitrary methods common in the Army, methods inseparable from the Army, without which no army ever existed. These Indians would feel that they were outraged by the change. I know their sentiments on the subject. Through that feeling there would grow up an irritation between the Army and the Indians that, sooner or later, would break out into actual hostilities, and the question would then come before the government whether we would not, as a consequence of the transfer, have a war with the Indians in large bodies in the place of these small outbreaks, which really are not so formidable, (speaking of the last two or three years), as to cause any serious apprehensions. By placing over the Indians Army regulations and management you would put over a people who are proud, and who resent interference, a government that would be distasteful and galling to them, and such as, under similar circumstances, white people would reject. You would put them in a position of antagonism which would lead to endless troubles, if not to endless wars. And General Sherman, in that report referred to by the Secretary, which argument he has never been able to overthrow, virtually says, "If you want to destroy the Indians, turn them over to the Army." I think a more humane plan would be that adopted by the Government of Chili, where they give the Indians unlimited whisky, and in a few years they are relieved of all anxiety on the subject.

The question of the military government over the Indians, in the place of the peaceful, civil government, is the great absorbing issue before the country to-day. You are all satisfied that if the same rule

were applied to the white population in any part of the country, it would beget irritation and strife and end in bloodshed. The anxiety of the people of the Southern States to have the Army removed was not for any actual offenses that the soldiers might commit, for these men could be held by the officers within proper bounds among white men, but it was because the presence of the Army was a constant menace to every Southern man, woman, and child as long as the Army was kept there for the purpose of enforcing obedience to law. It was said yesterday that possibly you might find an Army officer who could perform the functions of the civil agent as well as the civil agent; but that is not the question. I grant that you can; but the real question is, whether it is best to govern Indians by martial or by civil law, by men educated to war or by men educated to business pursuits. The Secretary alluded to the various wars and outbreaks among the Indians. You know very well how these troubles occurred. These wars did not grow out of the violation of treaty stipulations, but out of the fact that the military officers who began the war had behind them a military force. When a military officer gives a command, he cannot brook any defiance of it; whether right or wrong, the order must be executed; and, in the case of the Indians, they would be obliged either to submit or resort to force. A military agent over the Indians under the military system of government would place it within the power of any lieutenant to inaugurate a war whenever he chose. The civil agents are bound, first, by moral obligations, to keep the peace; they are bound, secondly, by the tenure of their office to keep the peace; because, if war, or a disturbance breaks out, and they are to blame for it, they lose their place immediately, and not only their place, but their reputation. But it does not follow that a military officer, as has been frequently shown in past history, would be displaced from his command, or even court-matialed, for a similar offense.

I wish to dwell on this phase of the transfer question, because I think that underneath this transfer lies a great danger to the government and the Indians in the future, a danger involving the expenditure of a great deal of money and an immense loss of life. These Indians in themselves are simple men. They have been led by kindness from the days of William Penn to the present time. They are susceptible of being governed by kind treatment. You can make an Indian your friend, and you can trust him fully, not only with your life, but with your property, and you can trust him with arms. But military rule will not beget friendship. When the Indians, before the year 1849, were under the War Department, there were comparatively few of them to deal with, and the force necessary was comparatively insignificant. To-day you have the charge of all the Indians from the Missouri River to the Pacific coast, and to-day all these Indians feel very sensitively on the subject of the transfer. The agitation of the subject during the last year has paralyzed the efforts of the agents somewhat to get the Indians to cultivate the lands, and it has unsettled the Indians very considerably. The question should not remain an open question after the adjournment of the present Congress. It seems to me it should be decided at once. If we say that the military shall rule the Indian, and that martial law is the law for the Indian, and if the government determines upon that policy, then that should be settled at once. If, however, we consider that to educate them in the arts of peace, and encourage them in the ways of civilization is the best course to pursue, then they should be left in the charge of the civil department of the government. For we find that under the instructions they have received during the last ten or fifteen years, yes, during twenty or thirty years, a great many of them have become civil-

ized, that a great many who a few years ago were "blanket" Indians are now wearing citizens' clothes, and have cut their hair short and adopted in other respects the white man's habits, and are preparing some of these days to assume the duties of citizenship. Now if with these results attained you should turn the Indian service over to the War Department, you would, most assuredly, imbitter the whole Indian race from the Atlantic to the Pacific coast against the government and the Army. Now there are about two hundred thousand women and children included in the two hundred and fifty odd thousand Indians in this country, exclusive of those in Alaska, and do you, gentlemen, propose to turn over these two hundred thousand women and children to the government of soldiers? A military government is always despotic. It must be in the nature of the case despotic, and these women and children will rebel against this despotism just as truly as though they had white skins; they will rise up against this kind of government. The danger from hostile outbreaks is now diminishing every day, and I can, in a few moments, give you the number of Indians who could possibly become hostile under our present arrangements. There were by the last report 250,811 Indians in the United States, exclusive of the Indians in Alaska.

THE PRESENT NUMBER OF THE INDIANS.

By the CHAIRMAN:

Q. In estimating the number of Indians, do you estimate those only that are under tribal relations, or do you include also those that are laboring in California, in the mines and on the farms, and who have no tribal relations whatever?—A. We take those who are in the agencies; there are some outside of the agencies; we do not include those. We only include those that are in the seventy-four or seventy-five agencies.

Q. These would be added in making up the sum total, would they not?—A. These do not need to be cared for, and are not included in the number reported.

Q. A question as to the number. Your report gives the number at 250,000, and this is a falling off of the number as reported many years ago; does this reduced number represent those that are now taking care of themselves, working for other people as farmers, herding and mining for other people, and are these counted at all with those that are on the reservations?—A. No, sir; those Indians only who were reported to the agencies were incorporated into our reports in giving the total number at two hundred and fifty odd thousand.

Now, to take one in every seven of these would be the rule in estimating the number of males capable of bearing arms. Take one, however, in every five, and there could not be over fifty thousand men capable of bearing arms, and from that number should be subtracted about twelve thousand civilized men in the Indian Territory, which would leave only about thirty-eight thousand men capable of bearing arms, and distributed among the various tribes. Of this number not more than one in every four could be considered as possibly hostile. This would reduce the total of possibly hostile Indians in the United States to 9,500 warriors, and these scattered over a wide extent of country. With kind treatment these are not likely to become hostile, and peace would be insured if a humane and civilizing policy were pursued with reference to them. I repeat that if this course is continued there is no probability of these 9,500 warriors becoming hostile. The question then arises as to the expediency of turning over to martial law these 200,000 women and children and some 40,000 civilized and semi-civilized peaceful men.

I think, therefore, that your committee in making these investigations

do not want to recommend a measure that might possibly result in the state of things I have suggested. I take it rather that you desire to inquire into these matters to see whether Indian affairs are honestly administered throughout the country, to see whether the agents are efficient and honest men, and whether the civil administration of the Indians shall be maintained as it has been maintained over the Indian population for the last thirty years.

DUAL RESPONSIBILITIES.

One topic has been recently touched upon in the discussions before this committee, and that is in reference to the dual responsibility, so called, of the present management. It seems to be in the minds of some gentlemen here that there is a two-headed government of the Indians. I think if you will take the pains to look into the matter as it is, you will see that there is really but one government of the Indians. The Army are called upon to repress disturbances in the same manner as they were called upon to suppress the railroad riots in Pittsburgh last year. The Indian service is the civil service. The Indian Bureau has charge of the Indians, and there is no conflict here—no real conflict of authority has occurred between the civil service and the military in the administration of Indian affairs. So far as I am personally concerned, I do not know of any conflict of authority between the military authorities and the Indian Office. I have been frequently in the office of the Secretary of War, and there has not been the slightest disturbance or collision, nor has there been any question about authority in the last two years. Whenever the civil agent has found that it was likely there would be a disturbance at his agency, he has immediately applied to the Army for assistance, and sometimes the application has been made on a mere apprehension of an outbreak; and it had better be so than to suffer the outbreak to occur before calling upon or advising with the military authorities in the matter.

THE BANNOCK OUTBREAK.

The Secretary of the Interior did not quite understand the position of Agent Danilson in the reference he made yesterday to the Bannock outbreak. He said that Danilson had been censured for not communicating with the troops as he should have done. That is an error. Danilson did communicate immediately with the military, but first telegraphed from Ross Forks, in Idaho, to the Indian Bureau. The telegraph office was a mile or two from the agency. The military were at Fort Hall, which was over a dividing ridge, some fifteen or eighteen miles distant by an air-line, and in the winter it would be necessary to make a journey of some twenty-five miles to communicate with the military post. But Agent Danielson not only notified us, but he notified the military authorities also.

By Mr. HOOKER:

Q. Did I understand you to say that the Secretary's statement that Danielson was censured and dismissed was an error?—A. He did not say he was dismissed, but that he was censured.

Q. And that was an error?—A. Yes, sir.

Q. I thought he said he was dismissed?—A. No; he did not say that.

Now, in this Bannock outbreak, we find that the soldiers were called upon in proper season; that they were upon the ground. The agent said he was certain from knowledge he had obtained, that "as soon as the grass grew," that is, in the spring, the Indians would go upon the

war-path. The military officers were there, and they thought differently. The military were anxious to abandon the agency. The agent telegraphed to me, and I went to the Secretary of War and requested that troops might be allowed to remain in sufficient numbers to preserve the peace; but General Crook, who was on the ground, and the military officers generally, came to the conclusion that there was no danger of an outbreak, and they withdrew all but twenty-five men. They did not do that, however, until they had made an unsuccessful attempt to disarm the Indians. The agent telegraphed to know whether we desired to have the Indians disarmed and have them taken as prisoners to one of the forts in the vicinity. An immediate reply was made, but before it was received the military authorities, as I have said, had made an unsuccessful attempt to disarm the Indians, when in some way they—that is, the Indians—got wind of what was to be done, and removed all their best ponies and their best arms out of reach. The military authorities, when they did finally disarm the Indians, took about three hundred ponies from the friends of the government—from Indians who were not hostile, and these were afterward very properly restored to them, when they commenced to plant, in the spring. But the military were on the ground, and in that particular case they failed to appreciate the situation. If they had taken the proper precautions, being on the ground, they could have prevented the Bannock outbreak absolutely; there is no question about it. But they failed to understand the Indians. They regarded the agent as a coward. General Sherman said he was "scared"; but the truth was that the agent did understand the Indians very well. He pointed out the danger, as you will see in the telegrams in my annual report. He told the military authorities that the Indians would certainly go upon the war-path as soon as the grass had grown sufficiently to feed their ponies. The result was precisely as he had predicted, and he begged to have the military forces remain there because he could not otherwise retain his employés.

THE CHEYENNE OUTBREAK.

In reference to the recent Cheyenne outbreak, the military, as you heard from Agent Miles's statement yesterday, were notified on the 5th of September that Dull Knife's band of Cheyennes had threatened to leave the reservation. The commanding officer at Fort Reno sent Captain Rendlebrock with two companies of cavalry——

[A gentleman present: "Eighty men—two companies."]

and they encamped within four miles of these Indians that he was sent out to watch. He did not go in their immediate vicinity, but encamped four miles off; and, as a result, he was not aware that they had gone until two policemen went to the agent and informed the agent that these Indians had left. They traveled twelve miles to reach the agent with this information, and the agent went two miles to the military commander to impart the information that the Indians had left! The military commander then sent the information to Captain Rendlebrook. In all this, nine hours were consumed before Captain Rendlebrook knew that these Indians had left. So that we can see from this little episode that the military government is not a perfect government; it is not omniscient; it cannot do impossibilities. The truth is, the Indians can outwit the military.

LIQUOR SOLD BY POST-TRADERS.

There is another objection to the transfer of the Indian service to the Army. It grows out of this fact: that at every military post in the United States the military post-trader has intoxicating liquors for sale.

It is the case at Fort Sill. You will find complaints of drunkenness of the soldiers and the Indians at the camp and in the vicinity of Fort Sill. When the military post-trader has liquor to sell the Indians will get it, and you cannot prevent it, because white men will come and buy it, and they will turn it over to the Indians. It is an utter impossibility to prevent it; it would be like trying to retain water in a sieve. Now, this is one of the disturbing causes of the military presence at Indian agencies, and we find it a very serious evil, for whenever the military post is near an Indian agency there is constant trouble growing out of the fact that intoxicating liquors are sold and that the Indians get it. We do not allow an Indian trader to keep a drop of anything intoxicating at any of the Indian agencies. The moment anything of that sort is discovered against an Indian trader his license is revoked, and he is driven from the reservation and obliged to take his property away with him. Wherever a military post is near an agency (there is not a military post near every agency, nor on every reservation, but there is quite a number of them scattered over the country in the vicinity of agencies) we have constant difficulty, I repeat it, growing out of the fact that the military post-trader will introduce liquor on the reservation.

At the Wind River Reservation it happened—and it was without my knowledge—that the military post-trader was also an Indian trader. Upon learning it, of course I immediately revoked his license; but he went off to the military post, a little way from the agency building, and opened a place where he sells liquors of all kinds, and it is a great evil, a great detriment to the service, and one of those things on which Congress should take action with a view to excluding the sale of liquors either on or off the Indian reservations or in their immediate vicinity. If we can have proper laws to suppress this evil, so far as they can be enforced they will be enforced by the Indian service.

RESPONSIBILITY OF INDIAN AGENTS.

I notice that one gentleman of the committee is making very proper inquiries as to who are bonded and who are not bonded officers in the Indian service; and that brings up a fact which I can make plain to you by reference to the change of system that has been adopted within the last few years. Formerly, Indian agents were intrusted with large sums of money to expend for various purposes. They made a large part of the purchases that were made for the Indian service. Of course there were evils connected with that plan, notably two. In the first place, the localities in which they bought the goods were not the best localities in which to buy; they were too far from the market. Prices were greatly enhanced when goods were found in the vicinity of agencies. In the second place, the agents paid the account and returned the statement as having paid it. The money being expended, the Treasury of the United States had no method of determining whether it was properly or improperly expended; the money had been expended and that was the end of it. That system has been entirely changed. The agent handles comparatively little money. All that he handles is that intended for the pay of the employés and for the articles purchased for the schools; and at the same time the agents throughout the United States are heavily bonded. We have bonds ranging from ten thousand dollars to fifty thousand dollars. The Blackfeet agent gives a bond for fifty thousand dollars; the Arapahoe and Cheyenne, thirty thousand; the Crow, twenty-five thousand; Fort Berthold, twenty thousand; Fort Peck, forty thousand; Green Bay, thirty thousand; and the Kiowa and Comanche, thirty thousand.

BONDED RESPONSIBILITY.

And in this connection I would like to say one more thing by way of comparison between the civil agents, and Army officers as agents of the Indians. I will grant you that Army officers as a class are as honest as other men are; yet they are no exception to the rule of humanity in this respect. You will find cases of dishonesty among Army officers as well as among other officers of the government; and the Army officer handles money of the United States without giving a bond. The Indian agent is under a bond, and under a heavy bond, and his bond is justified before a United States commissioner, and no instance within my experience has been found where these agents had given bonds that the bonds were not good and sufficient for the purpose of protection. As a rule, the bonds have been ample to protect the government against any loss whatever.

In looking over the Second Auditor's Report I find a few facts which have not before been made public in regard to the Army officers and soldiers. It happens that twelve hundred and fifty-three white men and sixteen hundred colored soldiers were paid claims which were subsequently shown to be forged ones. There are also twenty-one hundred and sixteen unsettled claims of soldiers which involve fraud and forgery. It also happens that there are three hundred and eighty-three cases in which ex-officers of the Army have overdrawn their pay. It also happens that there have been one hundred and forty-two cases in which double payments have been made to officers of the Army, in sums ranging from fifty dollars to fourteen hundred and fifty dollars. It also happens that twelve paymasters were found to be owing the government twenty-seven thousand eight hundred and eighty-seven dollars and fourteen cents ($27,887.14) and against whom suits have been instituted to recover the money. I mention these facts, not to throw any odium upon Army officers, because I do not wish to do anything of the kind, but simply to show the committee that it is still possible for men without bonds to misuse the public money, and the Second Auditor in his current report justifies the statement.

It is the custom of Army officers to inspect the goods sent to the different posts. It happens that in the vicinity of some of our western agencies it is impossible to get any man to inspect the goods in whom we have the fullest confidence. We never ask a man to inspect at any point unless we have confidence that he has, first, honesty, and, secondly, that he is competent to inspect in line of his experience; but we have frequently sent for Army officers to get them to inspect goods.

I found at the Red Cloud Agency, last summer, corn passed by an inspector that was sour and bad. I had the evidence of my senses; yet it passed the military inspector as good. These cases are not infrequent. I do not mean to say that the military officers are incapable of inspecting, but the military officer does not inspect; he takes a civilian who is supposed to understand his business, and the military officer makes no charge whatever. I speak of this because your judgment of the management of the bureau must not only be directed to large operations, but to the small and minute operations that go to exhibit the general character of the management, in order that you may see that we exercise a thorough and minute supervision over every item of supplies; that we do not waste anything, or neglect any opportunity of exacting a rigid and thorough scrutiny into all the business affairs of the service.

There is one thing more I wish to say in regard to the proximity of military posts to the agencies. Some may have supposed that we have a military post at every agency. That is not the case, and it would not

be desirable that it should be the case. In the Indian Territory there are Fort Gibson and Fort Reno, Camp Apache and Fort Sill, but there are several agencies where there is no military post, and in all these instances I think the Indians are better off, as at Yakama Agency, where there is no military post within one hundred and fifty miles. Now, there is a provision of law at the present time on the statute-books, in the Revised Statutes, that forbids the employment of a military officer as agent at any agency where he is not in company with his command. That has been the law of the government since 1828, I think, and that law has not been changed; therefore, cases that have been presented here—suppositious cases—where a military officer may be placed in charge of an agency without troops is not a practical question, because he cannot be placed in charge of an agency without the presence of his troops, without violation of law, unless the law is repealed or modified.

I do not know that I care to say anything more at present, except in answer to such questions as you may wish to put.

MINISTERS AS AGENTS.

By Mr. McCreery:

Question. I understood you to say that preachers do not make good agents.—Answer. I believe I made some such statement.

Q. If they are recommended by their respective denominations are they not appointed?—A. Within the last year and a half we have declined to appoint ministers, in many instances, as Indian agents. The cases where we have appointed ministers have been where they had been engaged in other commercial business also, and have not been simply theological students and ministers, but where they have also been engaged in some active business. In such instances, where they have been proved to be practical men, acquainted with affairs, we have appointed them; but as a rule we prefer not to appoint them.

DISMISSAL OF INDIAN AGENTS.

Q. How many Indian agents have you dismissed for cause since you came into office?—A. I suppose we have dismissed for cause about fifteen.

Q. How many have resigned?—A. I suppose about ten or twelve have resigned.

Q. "For cause," you mean irregularity?—A. We have also changed perhaps ten or twelve more because of their inefficiency.

Q. Ten or twelve in addition to the fifteen?—A. Yes; thirty-five in all; ten or twelve resignations, about fifteen for some cause connected with the service, which we considered prejudicial to the service.

Q. When charges of fraud are preferred against an agent, are you pretty diligent in looking into them?—A. We are; we do so, diligently.

Q. Do you recollect any charges made against Agent Jones at the Quapaw Agency?—A. I know Mr. Jones.

Q. Has any specific charge been made against him?—A. I think not.

Q. Do you not recollect a charge that he had turned over to the Indians two hundred bushels of corn bought by a man by the name of Morrow?—A. I do not remember that.

Q. Is there no evidence that this man Morrow testified in relation to the matter?—A. If you will tell me when it occurred, I may recall something of it. I do not know how long Mr. Jones has been in the service; he is now there.

Q. I know Mr. Jones is there; and, in fact, Mr. Morrow appeared be-

fore this committee at Seneca, and testified that he had never sold Mr. Jones a grain of corn.

The WITNESS. The charge has not been made under the present administration.

Q. It has not?—A. No, sir; not under the present administration.

Q. You say that fifteen agents have been dismissed for cause, and ten or twelve for inefficiency?—A. Yes.

Q. How many resignations have occurred?—A. Well, the number may not have been divided accurately; it would make more than thirty-five, but about one-third have resigned; somewhere in that proportion.

Q. Of the number who did resign, how many were square in their accounts with the government?—A. I think all were square in their accounts with the government.

Q. Every man?—A. I think so.

Q. No defalcations?—A. No defalcations.

Q. You are pretty sure on that point—that among the resignations there was no man behind in his accounts with the government?—A. I think not. However, his bond would cover any loss in that case; but there has been no case of that sort, because no agent has been behind in his account that I remember.

By Mr. BOONE:

Q. Was Mr. Wilbur a minister of the Gospel?—A. Yes, sir; he was.

Q. Well, he is one of the best agents you have, is he not?—A. Yes, sir; he is.

Q. Was Dr. Marston a minister of the Gospel?—A. He was.

Q. Did he make an acceptable agent?—A. Fairly so. Mr. Boone, I said that during the present administration of the Indian Office we did not appoint ministers to agencies, but I did not mean to say that a minister of the Gospel might not make a good agent. There are exceptions to all rules. I might take a vote of this committee on the general question of appointing ministers to be Indian agents, and you would, I think, unanimously agree with me that we had better not appoint ministers to such positions.

REMOVAL OF AGENTS FOR CAUSE.

By the CHAIRMAN:

Q. You say you have displaced for inefficiency and cause about one-third of the number—about ten or twelve. Now, do you investigate as soon as you dismiss, or do you dismiss without investigation some of these men, simply from reports made to you generally, by somebody, as to their inefficiency? Do you investigate before you turn out, or do you turn out and investigate afterward?—A. As a rule, we investigate first, and dismiss afterward. But the service during the last two years—or I may go back further than that, under Mr. Chandler's administration—has been undergoing a change. A reform was then commenced in the Indian service, and that reform has been carried on by the present Secretary of the Interior; and in order to reform the service we have dismissed agents for probable cause, for the reason that we did not want left in the service any men of doubtful character or capacity.

Q. Complaints have come to me that parties have been turned out simply on the representation of somebody that was around spying, or supposed to be, and that they were turned out without any notice and without any investigation, and they claim that up to the present time they have been lying under charges such as you see reason for dismissal, when they claim to be innocent. How is that?—A. Well, will you mention a specific case?

REMOVAL OF DR. BIRD.

Q. I will. I allude to the case of the agent at Fort Peck.—A. Well, I believe that Dr. Bird is an honest man, through and through an honest man, and I think he had some desire to serve faithfully as Indian agent; but evidence came to the office that he was inefficient as an agent; that he was not doing for the Indians as he should have done. Now, we cannot afford to have inefficient agents. I think it better that injustice should be done, if you please, to Dr. Bird than that the service should suffer in any way from an agent who has proved inefficient in his management.

The CHAIRMAN. Well, Dr. Bird goes out under a cloud; you might have saved him the humiliation of that by asking him to resign.

The WITNESS. I will state precisely what we did. Dr. Bird was appointed at the recommendation of the Methodists. We wrote to the secretary of the Methodist Missionary Society, asking him if he would kindly nominate a man in Dr. Bird's stead, or procure the resignation of Dr. Bird, so that we might appoint a man in his stead. The Methodist Board sent us a nominee in the place of Dr. Bird. I considered that an acquiescence in the views we had taken.

The CHAIRMAN. You asked the Methodist Church to make a nomination in the place of the incumbent, without giving any reasons for the vacancy you had made? And it is not the only instance of such procedure.

The WITNESS. If you will state the particular case?

The CHAIRMAN. The case of the Crow Agency in Montana.

REMOVAL OF AGENT FROST.

The WITNESS. Yes; Agent Frost. Well, that case is just this: Reports were sent to the office from parties of responsibility, charging that Agent Frost had made purchases for the government, and turned over vouchers for a larger quantity of hay than he had actually bought and received. There were several other statements of a similar character, and Montana is a long way off. It is almost impossible to send an inspector—for we have only three inspectors—to make an investigation into the case. And for that reason we asked the Methodists to nominate an agent in the place of Agent Frost. The Methodists did make such a nomination; and a very worthy man from Illinois, by the name of Kern, was appointed in the place of Agent Frost. Kern went to the Crow Agency, but Frost refused to deliver up and turn over the property to Kern unless Kern would receipt for his beef in bulk, without examination and without weight. Kern found out, after investigation, that, in his opinion, the beef herd was one hundred thousand pounds short, and he looked upon it as an attempt on the part of Mr. Frost to shift the deficiency from himself on to Mr. Kern's bondsmen, and Kern demanded the office peremptorily. I telegraphed Mr. Frost that he was displaced, and to hand over to Mr. Kern all the books and property of the agency. Frost refused to do it.

The CHAIRMAN. I think you have got away from the starting-point. I asked you in relation to the turning out. Now, as I understand it, there is an odium that attaches to every man that is turned out of the Department of the Interior, or out of any other department, and it goes all over the country that "another thief has been found," or somebody has been "caught stealing," or doing something else that is bad—they do not pretend to say what—and it is a serious imputation against a man. Now, I was asking you simply for the purpose of ascertaining how you transact this part of your business. These gentlemen claim that up

to this date, although one of them, Mr. Frost, has been out six months, there has been no investigation into their case.

The WITNESS. Mr. Frost out six months? O, no! He has really only been out of office the last twenty days.

The CHAIRMAN. You nominated his successor long before I left here, last June?

The WITNESS. But that did not displace Mr. Frost.

The CHAIRMAN. Well, if you have nominated some one to take his place, he was technically out of office only when his successor was in, but you virtually removed him before—a long while before.

The WITNESS. Undoubtedly we removed him; but it was a removal with the consent of the parties that nominated him.

The CHAIRMAN. But they claim that they had no chance to do otherwise. You displaced him without giving any reasons; hence they say that in the Indian Department men have to go overboard without having any reasons given for it whatever.

The WITNESS. I have no doubt that in some cases injustice may have been done to individuals, but it is absolutely necessary to put the service on such a basis as will make it the most efficient and that will remove every suspicion of weakness or incompetency in its management.

The CHAIRMAN. I have no objection to that; but here is a case in which you have had a man in the service two years, and you have had inspectors to report the condition of every agency, and at the end of two years you turn him out as "unfit."

The WITNESS. No; not that. These things do not appear until you go into a full examination of each case. Without efficiency of the highest order we cannot hope to administer the affairs of the service as they ought to be and must be administered. Dr. Bird is an amiable man, whom I would not pain for a moment, and yet I am satisfied, from evidence of his work, that he was not up to the standard of efficiency we have set.

The CHAIRMAN. I think you will be mistaken about Dr. Bird. I know him personally and well; and I will say for him that when he called at your office they said he was "an old man and not qualified." He is not as old as you and I, and we do not think ourselves very old, and he must not be charged with being "an old man."

The WITNESS. I believed Dr. Bird to be a strictly honest agent, and I have no charges against him, only the judgment that he is not suited to the position in that very important agency. If we do not exercise the greatest possible care in these matters General Hooker will probably tell me that some of these civilian agents are not doing as much as they ought to do; and I agree with him about that; and we want to remove every occasion, as far as possible, for just criticism of the Indian management.

The CHAIRMAN. I do not stand here to uphold any man, whether in high place or low; whether on my side or on another side; but my object is to find out whether you are doing justice to these men or not. I want to know how you manage it; and by speaking of these things we get at the facts. I wanted to know whether you dismissed a man for cause without giving him a chance. It may be that there are on your list of displaced ones men as honorable and efficient as some of those that are retained. That is all.

CAUSE OF REMOVAL.

By Mr. MCCREERY:

Q. I understood you to say that about twenty-five Indian agents had been dismissed for cause.—A. Not so many as that.

Q. I think you stated fifteen for malpractice and ten for incompetency—which is the best of causes for dismissal—and about ten resignations.—A. About one-third of them have resigned; the whole number of changes was thirty-five.

Q. You say fifteen for malpractice, ten for incompetency, and about ten by resignation.—A. Well, that might be about the proportion.

Q. When these religious denominations recommend a man do you make inquiry whether he is a preacher or not?—A. I do.

Q. And if he is a preacher you take that as a ground for rejecting him.—A. Yes; we have an understanding with the different bodies nominating men that they shall send their candidate to Washington at their own expense, that we may inquire into his antecedents and know him personally.

By Mr. HOOKER:

Q. I understood you to say there were about seventy-four agents in all, and that about thirty-five have been dismissed for cause.—A. Yes, sir; seventy-four in all, and thirty-five changes—not all dismissals, some ten or twelve resignations.

Q. During what period of time?—A. During the last year and a half.

Q. The last eighteen months?—A. Yes, sir; I would say rather that they would cover the period of Secretary Schurz's connection with the Interior Department.

Q. Since the elevation of the present Secretary of the Interior?—A. Yes, sir.

Q. The changes amount to about half the whole number of agents in that time.—A. Yes, sir.

Q. Were all these agents appointed on the nomination of the different denominations?—A. Not all of them.

Q. A large majority?—A. Yes, sir.

APPORTIONMENT OF THE TRIBES TO RELIGIOUS DENOMINATIONS.

Q. In what way are the various Indian tribes apportioned out among the various religious denominations?—A. They are divided among the leading denominations, not in any equal or fixed proportion; some of the denominations have more and some less.

Q. Well, they are divided among the Baptists, Methodists, Presbyterians, Catholics, Episcopalians, Congregationalists, Friends, &c.?—A. Yes, sir.

Q. What is the principle on which this division is made; how is it done?—A. The field was apportioned, originally, among the different denominations for missionary work among the tribes, for the establishment of schools and missions, and the general advancement of the Indians in education and Christianity.

Q. And now you generally appoint such agents as the denominations recommend.—A. Not always, but generally; yes, sir.

Q. Have you any instances of incompetency or infidelity on the part of the agents so appointed?—A. There have been a number of instances.

MANNER OF CALLING TO ACCOUNTABILITY.

Q. What steps are taken, where a man is dismissed, for instance, for malpractice, to hold him to accountability?—A. In the first place, we send an inspector to the agency to inquire into the case. The number of inspectors is limited to three. We need very many more for the most efficient conduct of the service. We send one of the inspectors to make an investigation. He is authorized by law to examine witnesses under oath, and he makes his report.

Q. To whom; to you, as Indian Commissioner?—A. Yes, sir.

Q. And you are governed by the report made by the inspector?—A. Yes, sir.

Q. And in that way you become aware of the whole method and management of the agencies?—A. Well, in the first place, we have the charges preferred.

Q. And then you send the inspector?—A. Then we send the inspector.

Q. And he takes the evidence?—A. Yes, sir.

Q. And makes his report to you?—A. Yes, sir.

Q. Where a man is dismissed for malpractice in his office, what course is taken in regard to holding him to accountability in the courts?—A. Wherever it amounts to a felony, we seek to have him indicted. There have been cases where we have agents indicted; quite a number of them.

Q. How many should you think?—A. Some four or five.

Q. For felony?—A. Yes, sir.

Q. What has been the character of the felony that they have committed?—A. It has usually been appropriating government property to their own use unlawfully.

Q. In what way?—A. One case, I remember, was in the weighing of cattle. The agent colluded with the contractor to increase the weight of the cattle. In another case an agent appropriated money to his own use improperly.

Q. What sort of money?—A. Greenbacks, I presume.

Q. What was the character of the funds intrusted to him?—A Supplies.

Q. Any in the shape of annuities due the Indians?—A. Well, there was one case only where the agent was acting improperly in the distribution of annuities; and another case where the agent would pay for labor in supplies, and enter it in his cash account as so much cash paid out.

Q. What authority has the agent generally with reference to the distribution of cash?—A. Very little at present. Formerly they handled a great deal of money and paid it out at their agencies; now the payments are made through the Indian Office out of the Treasury. We do not pursue the Army method in that matter. The Army officer pays out money and the account is adjusted afterward; and that was formerly the case with the civil agents, but all that is changed.

By the CHAIRMAN:

Q. You have the appropriations made beforehand and the accounts presented to the Treasury?—A. Yes, and they are passed upon by the Treasury; and it is by far the most satisfactory way of doing business.

PAYMENT OF ANNUITIES.

By Mr. HOOKER:

Q. Well, those Indians that have trust funds in the hands of the government, and whose annuities are paid to them in the shape of interest on those funds, how are they transmitted to the agencies?—A. Through a bonded officer.

Q. What officer?—Through any bonded officer; it may be an agent, or you may bond a clerk in Washington and send him to the agency with the funds. Usually it is through an agent, where we have an agent. In the Indian Territory, at the present time, they have no agent.

Q. We will take one agency; for instance, the Winnebago Agency, in the State of Nebraska; what amount of government annuities is paid to

those Indians?—A. I cannot say exactly; I cannot keep the books of the department in my head.

Q. Can you say approximately?—A. Not accurately. They pay them $40,000 a year. Formerly the Winnebagoes had a trust fund, amounting to $1,000,000, in the hands of the government, bearing 5 per cent. interest. They paid $200,000 out of that fund, I think it was, for the building of houses and other purposes for the benefit of the Indians, so that they now have left in the hands of the government some $800,000.

Q. Is it all paid in money to the Indians?—A. Not all in money—only a small proportion of it in money. The treaty with those Indians provides for its being paid in goods and money.

PURCHASING AND TRANSPORTING OF GOODS.

Q. How are the goods purchased and how transmitted?—A. They are purchased at the annual letting in New York, and sent to them by the ordinary means of transportation.

Q. Are you aware as to whether any sum per capita has been paid to those Indians?—A. I can tell that by referring to the books.

Q. Do you know the number of those Indians?—A. It is about fourteen hundred and ten.

Q. That is, on their reservation?—A. Yes, sir.

Q. The point which I wish to arrive at is, who has the direction of the investment and how is it invested; that is, this $40,000 that is annually due and paid to the Indians either in cash or supplies?—A. It is invested through the office of the Secretary of the Interior in United States Government bonds and in nothing else at the present time.

Q. You do not take my question. I wish to know how this annuity is paid. They get forty thousand dollars a year, you say, in goods and cash?—A. Either in goods or money—sometimes all in goods. I cannot tell you the proportion of each, whether it is all in goods or all in money.

Q. Who determines this proportion of the sum—the amount of goods and the amount of money paid in a year to these Indians?—A. The Secretary of the Interior.

Q. Does he determine the proportion?—A. It is left to the President and is delegated by him to the Secretary of the Interior.

Q. But you do not know just how the proportion is determined?—A. Yes; I can tell you [examining]. The treaty provides just how the appropriation made by Congress shall be paid.

Q. What I want to get at is whether or not the Commissioner of Indian Affairs, or the agent on the ground, or what other authority determines upon what proportion of this forty thousand dollars shall be paid to the Indians in goods and what proportion in money. Does the agent's report to the department of his judgment of the necessities of the Indians govern the department in its decision as to how much of this annuity shall be paid in money and how much in agricultual implements, goods, and what not? Is that reported by the agent?—A. No; the treaty provides for that. However, it gives discretion to the President, and that discretion is generally exercised, in fact, by the Appropriation Committees in Congress.

Q. The treaty only provides that so much shall be paid in bulk per capita, does it not?—A. No; it says so many goods, so many hats, shoes, coats, clothing, &c.

Q. And these goods are purchased under the direction of the Interior Department and transmitted to the Indians?—A. Yes, sir.

Q. Now, are you governed in determining the question what propor-

tion should be spent in agricultural implements by the representation of the Indians as to their necessities?—A. Not at all. By the treaty and the appropriations made by Congress.

BANNOCK OUTBREAK.

Q. You referred, in your statement, to the outbreak of the Bannocks, and to the fact that the agent there, Mr. Danielson, had been censured, as Mr. Schurz thought, or removed; but you stated that Mr. Danielson had apprised the military of the impending outbreak. I wish to call your attention now to the communication of General Sheridan, which is embraced in your own report, on page 14, in which he says: "It seem to me the agent should have consulted with the commanding officer about disturbances, which he neglected to do." What have you to say in explanation of that?—A. That is not the fact of the case. General Sheridan was simply mistaken in regard to that. The statement as I have given it is that the agent first telegraphed to Washington and then sent word to the commanding officer. The latter being some fifteen or twenty miles off, at the fort, they could not confer together till the military commander came to the agency, so that it was impossible for him to have been there to consult him; but he sent word to him of the apprehended outbreak at the same time that he sent word to Washington.

Q. When he sent word to the military officer, did not that officer, in point of fact, detail two companies to watch the Indians?—A. Yes, sir; under direction of the Secretary of War.

Q. The military commander did not interfere until called upon to do so by the agent?—A. He did not.

Q. Well, these Bannocks made their escape during the night, did they not?—A. The Bannocks made their escape months after the troops had been called for.

Q. I understand that; after the agent had given notice, on the 5th of September?—A. O, you are speaking of the Cheyennes.

Q. Yes. I beg pardon. I speak of the Cheyennes.—A. The agent had given notice of the possibility of Dull Knife's escape; the troops were stationed some four miles from where he (Dull Knife) was.

Q. But the Indians, in point of fact, escaped during the night, did they not?—A. During the night or early in the evening.

Q. And they pursued by the military as soon as they learned of the escape and there was no interference on the part of the military until the agent called upon them to pursue?—A. I beg your pardon, the statement was this: On the 5th of September, the agent notified Major Mizner that troubles were brewing in Dull Knife's band, and that they threatened to leave. That caused Major Mizner to send out two companies of cavalry under Captain Rendlebrock, to plant himself by the Indians and watch them. Instead of that, they encamped four miles distant, and did not know of the Indian's departure until they were informed through the agent, who had notified Major Mizner of the escape, and he in turn had communicated the fact to Captain Rendlebrock.

Q. How far was he from the agent?—A. Do you mean the military commander?

Q. Yes, sir.—A. Major Mizner was at the camp at Fort Reno.

Q. How far distant from the agency?—A. Two miles from the agency.

Q. Well, then they were pursued by the military as soon as they learned that they had escaped, and they attempted to disarm them and bring them back, but were resisted by the Indians?—A. Yes, sir.

Q. I so understood the statement of the gentleman who testified yesterday.—A. That is correct.

Q. Well, the military committed no error then, in your judgment, except that they did not go near enough?—A. The error was that the military should have gone immediately in the vicinity of the Indians and taken care that they did not escape.

Q. And when they did escape they pursued them at the instance of the agent?—A. Yes, sir.

Q. You said, in your direct statement, that the military wanted to take away the troops and break up the agency?—A. What agency do you speak of?

Q. I speak of the agency of the Bannocks.—A. Yes, sir; I said that the troops were very impatient to get away from the agency; exceedingly anxious.

Q. Was that remark intended to apply to the Cheyennes?—A. Not at all; but to the Bannocks.

Q. In this instance did not the agent, Mr. Danilson, call upon the military to remain there, and insist that they should remain?—A. Yes, sir; he did.

Q. And did he not further say that if the military should go away, that they would be compelled to break up the agency?—A. He said the employés would leave.

Q. There was an instance, then, in which, if the military had not been present, the agency could not have been maintained?—A. Undoubtedly. It is precisely for that purpose that troops are placed in the vicinity of the agencies. They are called upon in emergencies, just as the troops were called upon in the railroad riots, because they are needed. They are needed in case of troubles with the Indians, and are called upon just as legitimately.

Q. Very well; they should then be at or near every agency?—A. Not necessarily.

Q. How far distant were the troops located from the Bannock Agency?—A. They were stationed some eighteen miles distant, in a direct line, or twenty-five miles by road. There was between the agency and the fort quite a high mountain range. In summer it could be crossed easily. In winter it would require a detour which would make the distance fully twenty-five miles.

Q. When this correspondence began—in November, I believe—what was the condition of the approach at that time; was the fort easily accessible then?—A. It was somewhat difficult in December, sir.

PROSECUTION OF DEFAULTING AGENTS.

Q. In point of fact, Mr. Commissioner, what successful prosecutions have been instituted in the civil courts against defaulting agents and contractors?—A. You are aware that all such prosecutions are handed over by the Indian Bureau immediately to the Department of Justice, and it becomes a matter for them to prosecute; it immediately ceases to be a matter for the Indian Office to take action upon, unless called upon so to do by the Department of Justice.

Q. That may be true, but I want to get at the facts; what number of convictions by the Department of Justice have come to your knowledge—convictions of defaulting agents?—A. I do not know that I can state exactly.

Q. You say that fifteen agents have been removed for malpractice in office? Now what proportion of these have been indicted and successfully prosecuted?—A. To answer that, you will see that a discrimination will have to be made as to the cases. One man was dismissed, for instance, for a cause like this: In paying the annuity money, he did not

pay it directly to the Indians, but paid it to the trader to satisfy the Indians' debt to the trader. I considered that highly improper, and removed him; and yet that was not an indictable offense, because the Indians receipted for the money as paid to them.

Q. In those five cases of felonious prosecutions you spoke of, how many convictions were there?—A. None of these cases have been brought to trial. One indictment was found a year and a half ago in the Indian Territory, and twice the Department of Justice was urged on the part of the government to try the case, and twice it has been adjourned. There are other cases of indictments found more recently that have not yet been brought to trial.

Q. Have any cases of conviction been brought to your knowledge?—A. No, sir.

Q. Is it not the fact that in the administration of your office it has been necessary to detail officers of the Army to act as Indian agents?—Yes, sir; we have thought it desirable in some cases to do so.

MILITARY OFFICERS AS AGENTS.

Q. Can you name any instance in which it has been done?—A. It was done in the case of the Spotted Tail Agency in 1873 or 1874—no, later than that, in 1876, I think (turning to a gentleman at his side, "What time was Lieutenant Foote detailed to take charge of that agency?" "In 1876, I think," was the reply).

Q. Well, as you have alluded to that case, are you aware of the fact as to what number of Indians he found there, and what number had been returned by the former agent—his name is Howard, I believe?—A. Yes, sir; Howard. Well, there is this difficulty in getting at the fact in this case: Previous to that time, it was claimed by the agent that he could not count the Indians that were hostile; and the Indians were in the habit of going off and on—of leaving the reservation; and there might be a discrepancy owing to these causes, and yet the count be as accurate as circumstances would admit. You might go at one time among them and find not more than three or four thousand there, and at another time there would be seven thousand, or between six and seven thousand; and yet these six or seven thousand might not all belong to that agency, and no method of counting them would give the accurate number—it would be liable to a discrepancy. At the same time, I believe that the number was overrated by the agent.

Q. Does not General Crook report that, when he took charge of that agency, the civil agent, Howard, had been making requisitions for nine thousand Indians, when, in point of fact, there were only four thousand Indians in his agency?—A. That might have been and yet not be to the detriment of Howard. It might happen that when General Crook took charge there were but few Indians at the post; because, as I have said, at that time the Indians were given to roaming—were off on the hunt—hunting buffalo.

Q. Does he not state that the agent asked him to receipt for that number—nine thousand?—A. Possibly. It is my opinion that Howard overestimated the number of the Indians, and reported more than he had.

Q. Yet you dismissed him?—A. He was dismissed before I came into office, but somewhat on that account.

Q. That was prior to your being here as Commissioner?—A. Yes, sir.

Q. In the cases of Lieutenant Foote and his successor, Lieutenant Lee, what sort of Indian agents did they make with the Spotted Tail Indians?—A. I cannot speak for Lieutenant Foote. I did not know him

personally; but I do know Lieutenant Lee personally, and I think that Lieutenant Lee was a fair agent. I think he was fair.

Q. Did he not, in point of fact, give great satisfaction to the Spotted Tail Indians themselves?—A. I think he did. He gave satisfaction to Spotted Tail; but the question whether he was really a good agent would not hinge on that.

Q. Possibly not; but you alluded to the fact that the Indians themselves were averse to the military being over them because it was calculated to make them hostile?—A. General, I wish to make a wide distinction between the general policy of employing military officers as Indian agents under the civil government and employing military officers as agents under the War Department and the Army government, because the two are incompatible.

Q. Suppose, Mr. Commissioner, that the Indian affairs were in the hands of the War Department, and that the War Department should detail Lieutenant Lee, or a man like Lieutenant Lee, to act as agent, and require him to report to the War Department precisely as he now reports to you, and would conduct himself, in the administration of his affairs under the War Department, precisely as he conducts himself there at the present time, would there be any difference in the management of the affairs of the agency?—A. That is not strictly a supposable case, because you change the circumstances most decidedly. Under the civil government he would do one thing, and under the military another. You understand, general, very clearly the distinction between the organization and methods of the civil and the military governments. Under the civil government a military officer is not objectionable, but under the military government a military officer as agent would be objectionable, because, in the one case, it would mean a threat, coercion, arbitrary power, and more or less despotic rule, while in the other case it would not be so.

Q. Well, do you mean to say that if this office were transferred to the War Department that the War Department would be disobedient to the laws as they now exist, in reference to the management of the Indians, or with reference to carrying out the treaty stipulations?—A. I think I can make my meaning clear; that, going under Army orders, an agent, with men at his command, is more likely to be embroiled with the Indians, and to become distasteful to the Indians. The civilian goes there without an army, without a command, without even a policeman's club.

PRESENCE OF TROOPS NECESSARY IN SOME INSTANCES.

Q. But I understood you to express the opinion that at a great many of the Indian agencies it is necessary to have the troops now?—A. Well, not at a great many of them; at some of them it may be necessary. The question has come up within a very short time. The War Department sent to us to know if we desired a military post at the Red Cloud Sioux Agency. I sent back word that unless from a military standpoint it was deemed necessary, we did not desire to have a military post there, but that if they would connect Camp Sheridan by telegraph wire, some fifteen or twenty miles distant, with the agency, it would answer every purpose.

Q. Precisely, if the camp were near enough so that the agent could call on the military when necessity should require it?—A. Yes, sir.

Q. Well, do you understand that if the Government of the United States should transfer this bureau to the War Department it would change any of the treaties we now have with the Indians, or any of the laws passed by the government with reference to the management of

the Indians by the War Department? In the management of the Indians by the War Department, would not that department be implicitly bound by the treaties and by the laws of the land as now?—A. There are several questions involved in that. If you will put them separately I will endeavor to answer them.

Q. Just indicate an answer. I see only one question.—A. Will you be good enough, then, to repeat the question?

Q. If the Indian bureau should be transferred to the War Department, with all the treaties between the government and the Indians now in force, and all the laws on the statute-books with reference to them, would it necessarily follow that the military authorities would not obey and carry out these treaties and these laws precisely as the Interior Department is now obeying and carrying them out?—A. I will answer that it depends upon who administers the government. A change of the administration, say from Democratic to Republican, would change the whole course of the government.

Q. Not with respect to the Indian government?—A. The chances are that if you were to change the administration of Indian affairs from the civil to the military—if you were to make so radical a change as that—you would change the nature of the administration absolutely and without any doubt.

Q. That would be very true, Mr. Commissioner, would it not, if, when you say transfer it to the military you mean by that that you are going to send an agent with a captain of a company with him to govern him; but in case we detail an officer of the Army to conduct Indian affairs, under the supervision of the Secretary of War, would not he be obliged to carry out the laws and the treaties which the government has with the Indians?—A. He would be obliged to obey the laws, unquestionably; but the administration of the law would be different in the two cases. The question of administration leaves a very wide margin for consideration in the case.

Q. Allow me to ask in what respect the War Department would have any motive to construe a treaty or a law differently from what the civil department would construe it?—A. I am not speaking of construing a treaty or a law, but of methods of administering. I have not spoken of law, but it is the method of administering the law that I speak of.

Q. Well, it is the execution of the law, the faithful execution of it, between the Indians and the government, that the government wants; now is there anything in the character of the men who would be detailed from the Army to act as agents and execute the law with the Indians, that would make it impossible for them to carry out the obligations of the government faithfully to the Indians and faithfully to the government?—A. I think I have answered that question, substantially, several times. If I have failed to convey to you my meaning, I will repeat my opinion on the question. In the one case, the administration represents force, arbitrary power; in the other, it is a government of peace. Where the rights of the Indians are respected, where his friendship is counted upon as a part of the method of governing him, the difference in the result is very marked and wide. But—excuse me for saying it—you cannot carry water on both shoulders; you cannot tone the civil government up to the military standard, nor bring the military government down to the civil standard. They are different.

Q. Now, to illustrate how far that difference exists in point of fact: Suppose that an Army officer should be detailed for the purpose of acting as an Indian agent at an Indian agency, and he receives and distributes to the Indians their annuities and supplies faithfully, and reports it to the

government, and employs all the civil agents that are employed now, using the Indians as you do when you can, is there anything necessarily in that kind of government that would be a violation of the treaty stipulations, or the law, with the Indians?—A. There would be just this difference—a difference in the general character of the management, as I have described. If the service were turned over to the War Department, the military methods would be pursued, and that would be unavoidable. The military government works in a certain direction, and is as distinct and separate from the civil government as it is possible to be. I only need to refer, by way of illustration, to the Southern States. In Mississippi, for instance, you do not want—the people do not want—the presence of the soldiers to enforce any law. You say that the citizens will obey the law. You do not want, will not have, the military there. And you make a very just and proper distinction between a military and a civil government in that case. Soldiers are the last thing you want. A man in uniform is distasteful and objectionable. You do not want him around. You do not want the military to say to you, "You must do this or that." The Indian is just like the white man in this respect.

Q. You don't want the military in your management for the same reason that we do not want it in Mississippi. Do you mean to say that the two cases are analogous?—A. I do.

Q. You have said that a large majority of the agencies require a military post at or near them?—A. No. You asked me if a large number did not need the military, and I said that I did not think that a large number did. Whenever the Indians are hostile or troublesome they need the military; not otherwise.

THE METHODS OF THE MILITARY WOULD EXCITE THE INDIANS.

Q. But in order to have the military there must be troops somewhere in the vicinity, and hence arises the necessity of having a military post at certain agencies, and it is consequently not analogous to the case of soldiers in Mississippi.—A. I think the case I quoted is quite analogous, and that the difference between a civil and a military government in the management of the Indians is just as broad as the distinction between night and day. We all understand it clearly. To transfer the methods of the military government to Indian affairs, knowing the Indians as I do, would be disastrous to the Indians. It would excite the passions of the Indians. It would be the occasion of disputes and outbreaks, and finally lead to the most serious consequences to all. The instance cited by the Secretary yesterday in that cow case shows the impolicy of putting the military in charge of an Indian agency. You put a man with arms in his hands in that position and he can say, "Give up the cow or the man who stole the cow"; and on their refusal, he fires into them immediately. That is very different from the course of a civil agent, who will say, "Give up the cow"; and the Indians say, "We have eaten the cow and cannot, but we will pay for that cow." The agent accepts pay for the cow. If you put arms in the hands of civil agents in the same way, and put a body of men behind him, he will commit the same indiscretion.

Q. In the instance to which you refer you would have thought it was the duty of the agent to take the restitution?—A. Yes, sir.

Q. And arrested the party who committed the violation?—A. Undoubtedly.

Q. And if powerless you might have called upon the troops?—A. I might have done so. There is this difference: It would allow the man who made the demand opportunity to cool, and his personal dignity

would not be involved in the dispute; therefore, no military force would be used, and nobody killed.

Q. Take the instance of the restitution of the 300 ponies which you say were taken from the peaceable portion of the tribe. They were given back by the advice of the agent?—A. By the unanimous advice, not only by the agent, but of the military.

Q. Both by the military and agent?—A. Yes, sir.

Q. In instances where the military are detailed, they have in point of fact exercised no other force over the Indians than was necessary to execute the law and to carry out the faith of the government with them, as in the case of Lee and others?—A. My dear sir, that was done under civil government, and under civil government a military officer becomes a civilian. He is a civilian in every sense of the word, and is not acting as an Army officer.

Q. If detailed from the Army under the supervision of the Secretary of War, would he not be the same man, having the same judgment and discretion; and would he not be likely to govern himself in the same way?—A. I think it would make quite a difference. If a gentleman representing any of the States in Congress should come to the Capitol with 10,000 men, armed and equipped, and he himself armed, and if he should get into dispute with other members of Congress, it is not at all impossible that a man under those circumstances would storm the Capitol and take possession.

Q. That is predicated upon the idea that in detailing a military officer you would detail a squad of soldiers with him?—A. Let us get at the facts plainly. Suppose the transfer were made to-morrow. Immediately a military officer would be put in command of the various Indian agencies. His duty at present requires that he should be with his command, and if with his command, military authority and military law would become the law of the agency.

Q. Then, in the double system of inspection—the inspection by the civil agents and the inspection by the military as well—you have, according to your own statement, a great many defaulting agents?—A. We have not a great many defaulting agents. Our agents are under bonds, and therefore the government loses little or nothing. But you are going to substitute men without bonds for those who are under bonds.

Q. Suppose it was under the Commissariat and Quartermaster's Department?—A. They give bonds of course, but the agents in charge of the agency would not.

Q. The men who would have transportation of the goods would be under bond?—A. They would be transported precisely as they are now, and the agent would distribute them precisely as at present. The quartermaster would not necessarily do it.

Q. But the Commissariat and Quartermaster's Department would be responsible for transportation?—A. Yes, sir.

COLONIZATION OF THE INDIANS.

Q. In reference to the colonization of these Indians on reserves, what is your view upon that question as to whether or not it is policy to colonize northern Indians in the north and the southern Indians in the south?—A. Undoubtedly, that is the proper policy.

DIVISION OF LANDS IN SEVERALTY DESIRABLE.

Q. You have adverted in your annual report to the fact that a great many whites are encroaching upon the reservations of the Indians.

What is your opinion as to the effect of dividing their lands in severalty? Take the Indian Territory for example—what would be the effect?—A. I think it would be beneficial to the Indians to divide their lands in severalty as fast as they want to take lands and work them. I think every effort should be used to get them, as rapidly as possible to take up lands in severalty and go to work for their living. The ultimate policy of the government should be, it seems to me, to make these Indians self-supporting. That can be done by the civilizing process.

Q. Do you regard theIndian Territory as sacredly set apart by treaty?—A. I do.

Q. And ought not to be encroached upon by the whites?—A. It ought not to be encroached upon by whites.

Q. Don't you think that the division of their lands in severalty would have that effect?—A. I do not think so. I would retain the reservation system, and that would exclude the white man.

Q. And merely allot to such Indians so much as they can cultivate?—A. I have recommended, also, that such allotments be held sacred for 25 years; that it be inalienable during that period.

Q. If there was no interference by the War Department with the progress of the Indians in agriculture—if there was no interference with the Christian or civil denominations, if it should be transferred to the military department, what would you say in objection to the transfer?—A. It seems to me to exhibit a poverty of statesmanship when we admit that there cannot be devised any method for governing the Indians without relegating them to the Army for that purpose.

EDUCATION OF THE INDIANS.

Q. The Indians have schools under contract, haven't they?—A. Some of them by contract and some by agency employés.

Q. By teachers employed by the agents?—A. By the office.

Q. Do they have a contract school at the Winnebago Agency?—A. Yes, sir.

Q. And that is the case in most instances, is it not?—A. That is the case at about one-half of the agencies.

Q. The Indian agent, in point of fact, with the exception of where there is not a contract school, has nothing to do with the education of the Indians except the supervision of that department?—A. The agent has the supervision of the contract schools, and they are as much under his control as any part of the agency.

Q. Still the teacher of the contract school gets so much per annum?—A. So much for tuition and board.

Q. And he employs his assistants and is responsible for their conduct? The agent, of course, has supervision over all of them?—A. Yes, sir; but we do not consider that best for the agency children. The school contractor is supposed to take the work for the profit, and in order to make the profit larger he may deprive the children of the amount of food they ought to have. We would prefer to have all the schools under the agent's charge. Undoubtedly, that would be the best thing.

Q. Is it not the duty of the agent to look after that under the contract system?—A. Yes, sir; but still my opinion is rather against the contract system, because the children might not be as well treated.

WAR THE INEVITABLE RESULT OF A TRANSFER.

Q. Is there not at most of the agencies now employed and paid by the government a farmer, a blacksmith, a wood-worker, a miller (if they have

a mill), an engineer, a physician, &c.; those various officers are kept at most of the agencies? Now, if they were not interfered with by a military officer, and went on carrying on their business, would there be any retrograding of the Indians because simply a military man was agent?—A. I think there would be, most decidedly. Under an Army officer, the places of the present employés of the agency would naturally fall into the hands of soldiers and subofficers, and all other things would naturally tend in that direction. The whole tendency of a change from civil to military government is to establish a despotism—a kind of government we are all opposed to. These Indians are as intelligent about the proposed change as white men. Is it safe to make a change that will reverse the present peace policy and throw the Indians into commotion and perhaps precipitate a war such as we have never seen in this country? To my mind, war will be the inevitable result of the transfer of the Indians from a civil to a military rule. As to the economy, General Meigs was not far out of the way when he said twenty millions will be the cost of the Indian service under the War Department. It would cost that in two or three years if no considerable war should follow the change. When we have got a civil government that is doing better than it has done in the past, and improving in every sense, one that is admitted to be honest, even by men desiring the change, and who further admit that it is conducted as honestly as any other branch of the government service, what, then, is the reason for a change? Cannot civilians carry on the civil government?

THE BUREAU FORMERLY UNDER THE WAR DEPARTMENT.

Q. When the Indian Bureau was under the War Department in former times, in 1849, it was a separate organization supervised by the Secretary of War?—A. It had at that time a Commissioner of Indian Affairs, but it was under the Army. General Scott was really the chief then.

Q. The Indian Bureau then existed as a separate establishment precisely as it has been since it was transferred to the Interior Department?—A. Not precisely. It is now systematic and methodical in its business management. In the War Department it never was.

Q. The systems and methods are simply designed to transport to the Indians whatever appropriation is made by the government, and the government is under obligations by its treaties to the Indians. Have you not many instances in which the present system has failed to transport to the Indians whatever appropriations the government designed for them?—A. There have been a good many cases of that.

PRESENT CONDITION OF THE MODOCS AND NEZ PERCÉS.

Q. You visited the Indian Territory this season?—A. Yes, sir.

Q. How did you find the Modocs?—A. Diligently at work trying to earn their living.

Q. How as to supplies?—A. Very little is appropriated for supplying the Modocs. They mostly support themselves. There are only about $7,000 appropriated for the support of the Modocs. They are therefore deriving their support from their own labor.

Q. Did the Nez Percés make any complaints as to provisions?—A. I did find the Nez Percés sick, and you will pardon me for alluding to it as one of the consequences of military command. While they were in General Pope's department they were put down upon the river bottom with a lagoon between them and Fort Leavenworth, and they became fearfully sick.

Q. Was that after subjugation?—A. Yes, sir.

Q. Where?—A. On the Missouri River. They were taken sick and dying to the Indian Territory. Three died on the way. After arrival they found set apart for them some supplies and cattle, turned over by Agent Boone, who had the Ponca Indians in charge at the same agency, who were removed about the time of the arrival of the Nez Percés. Boone had received some inferior cattle. I think he is honest, but he had been imposed upon by the contractor or his own clerk. These cattle were still kept at the Quapaw Agency for the Nez Percés. I think Agent Jones was censurable for receiving those from Boone. He should not have received them, but should have informed the department of the inferior grade of cattle. I found out the flour was not good and the beef was not as good as it ought to have been. The flour was not fit for sick Indians. It might have been very well for healthy Indians.

MILITARY OFFICERS AS INDIAN AGENTS.

Q. Have not the Indians who have come in contact with the military expressed very great confidence in them; for instance, the Sioux Indians in General Crook's department? Did they not express a good deal of satisfaction with the fidelity and promptness and honesty with which the military have dealt with them wherever they have been brought in contact, and especially in this regard, in fulfilling the promises made to them?—A. In regard to Lieutenant Lee, he made a promise to Crazy Horse which, owing to circumstances beyond his control, he could not fulfill. Military officers sometimes make promises which they cannot fulfill. General Miles promised Joseph he could go back to Idaho, yet General Miles was overruled by a superior officer, General Sheridan, and the Nez Percés were sent to the Indian Territory.

Q. Did you not find great mortality existing among the Modocs, owing to malarial diseases?—A. Not among the Modocs, but considerable among the Nez Percés and Poncas. All the northern tribes when sent to southern latitudes must necessarily become acclimated, and during that process they lose a great many lives. The same malarial diseases prevailed in Kansas during the last summer, and quite as badly as among the Indians in the Indian Territory. But to come back to the Sioux. Lieutenant Lee was in charge of the Sioux during the removal from Nebraska to the Missouri River (it seemed necessary to have military officers in removing them at that time). Since then, both Red Cloud and Spotted Tail Indians have had civilians as agents. Their government is quite as satisfactory to the Indians as was Lieutenant Lee's, and I think rather more so. I think the Spotted Tail Indians are in a better condition to-day than when Lieutenant Lee was there.

REMOVAL OF THE SPOTTED TAIL AND RED CLOUD INDIANS.

Q. They said they would move themselves if they were not moved?—A. By the treaty of 1876, these Spotted Tail and Red Cloud Indians promised to move to the Missouri River and receive their supplies there. When they came to Washington a year ago last September, General Crook interceded to allow them to go back and select homes on the reservation westward from the river. The President said, "When the great council of the nation (meaning Congress) shall pass the necessary law, we will permit them to go back and occupy such places as they want to." That necessary law was not passed until the 27th day of May last, near the close of the fiscal year. None of the appropriation could be used under the law until the first of July, and then a commission was appointed by Congress to visit these agencies and see if they would consent to remain on the Missouri River. Lieutenant Lee said to those Indians a few

days before the arrival of the commission, "You say to this commission you are going back. You tell them you are going back whether they like it or not, and don't be afraid to say it to their faces." That was the advice coming from a military agent, and it seems to me in very bad taste and improper.

Q. And the Indians did so state?—A. As a matter of course.

Q. They told the commission they would move themselves if the government did not move them?—A. They said they would go there; that they wanted to be moved in ten days.

Q. When were they removed?—A. They removed themselves.

Q. At what time?—A. About the 1st of September.

Q. Of the present year?—A. Yes, sir.

WASHINGTON, D. C., *December* 9, 1878—10.30 a. m.

Hon. LOT M. MORRILL sworn and examined.

By the CHAIRMAN:

Question. You are a resident of Maine, I believe?—Answer. Yes, sir; my residence is at Augusta.

Q. I believe you were formerly a member of the Senate for some years, and while a member of the Senate you were a member of the Committee on Indian Affairs?—A. Yes, sir; I was for several years.

Q. You no doubt took some pains to ascertain the state of affairs during that time?—A. Yes, sir; I took a good deal of interest in the matter of Indian affairs, and paid considerable attention to it. I was not chairman of the committee; but I was on it many years. I am not sure but that I was on the committee when I left the Senate.

Senator MCCREERY. Yes, sir; you were.

By the CHAIRMAN:

Q. This committee would like to hear as to what you would consider the best policy to adopt in the management of the Indians, to bring into account the good of the Indians and economy to the government. The question has arisen, and I do not know that it is a late question, as to the advisability of turning the management of Indian affairs over to the War Department. That is the leading feature of the business of this committee, and we are anxious to get any information from those who have had experience, and also opinions as to what would be the best course to adopt toward the Indians. We would be glad to receive any general information from you, and also what policy you deem best to pursue in dealing with the Indians.—A. Mr. Chairman, I do not know that, in the sense of being able to testify to you of any facts as a witness, I could be of much service to the committee. The Indian question I have paid some attention to, and I have some very decided convictions and opinions about the condition and treatment, which I could submit to you in a general way, but have no prepared speech, and do not have any facts not already known to you.

Q. All we want is the substance of what you have learned through your investigations; and if you have an opinion we would like to have it, based upon whatever character of evidence you may possess.—A. I understand the proposition to be a transfer ofthe Indian management, or the Bureau of Indian Affairs, from the Interior to the War Department.

PRESENT INDIAN RELATIONS VERY POOR.

Q. Yes, sir; that is the object.—A. And with it you are charged to inquire as to the expediency, propriety, and fitness of the thing. I do not venture an opinion in the outset, Mr. Chairman, in regard to the expediency or propriety of such a proposition. If I speak of that at all, it will be by and by, after giving some general notions about our Indian relations, which unhappily, I think, are very poor relations indeed. I speak of Indian relations in contradistinction to Indian affairs somewhat in this regard. I think these relations the result of a policy of exclusion adopted in the beginning, based on the assumed intractability of the Indian as a man and race, which assigned them a place outside the jurisdiction and population of our laws and the influences of our civilization; and thus as our population increased and our settlements advanced and our borders extended the Indian was forced to retreat, and has been kept upon the outer border, and so beyond the reclaiming influences of our laws and our civilization. We have communicated to him very little of our virtues, and from the necessity of the case, he being always outside of our civilization and in that limbo which is just beyond the advanced guard of civilization, he has had much the worst of it, and so today we are dealing with the remnant of that race, whose population once numbered millions, and occupied this whole domain, now meager and fragmentary tribes, in numbers less than 300,000, all told; the possessions of which have mainly become the possessions of our people, and every acre and every rood, not absolutely in possession, the covetous eyes of the restless and resolute pioneer rests on every rood of land, either on the plains or in the mountains, are supposed to be valuable. Our population is everywhere.

I attribute the condition, therefore, of the Indians (that is, generally speaking) as growing out of the false credence in regard to the nation's duties to this race.

CONDITION OF THE INDIANS FROM 1850 TO 1860.

As I have no speech to make, I will confine myself to a very few remarks as the result of my reflections upon this subject. Our Indian affairs from 1850 to 1860 underwent a thorough revolution. Our Indian affairs in that region of country, now known as the far West, underwent a thorough and rapid change. Up to that time the Indians were dealt with as the progress of population and settlements required, and there was land enough beyond to which the Indians could go. But when gold and silver were discovered in California and later in Colorado, that whole Indian country, which to our people hitherto was land unknown, was penetrated by our population; vast streams of population, so to speak, of pioneers flowed into that country. Out of that grew the wars that followed, and the result of that has been that our population are now everywhere and at all points in contact with the Indians. There is no place, literally no portion of the country, where our population are not. That is true of that whole country. You will find our people in one character or other, miners, hunters, traders, squatters, and pioneers, the result of which is general warfare, predatory warfare.

Now it seems to me apparent that this condition of things has devolved new duties upon the government, and in dealing with the question it strikes me you will find it necessary to resort to new methods. There are some 70 reservations in that country, and possibly more. Those reservations have an aggregate area, I suppose, about equal to the area of the thirteen original States, in which you have now sixteen millions of people, and yet about 130,000 Indians occupy that territory.

There is no way to protect those reservations I know of on earth against the incursions or invasions or progress of settlers. You might as well legislate against the ebb and flow of tides as against the progress of American settlements. They will go on, and the question is, what will become of the Indian as they advance?

In this connection allow me to say what I think the duty of the government in that regard is. I think this remnant of Indians is entitled to protection, the protection of a great people, of government and of laws. I think they are so entitled, in the nature of the case, independent of any stipulations or treaties. I had the good fortune of being out in the Indian country this last season, and there having been a vacancy in a board of gentlemen sent down to treat with the Ute Indians, they persuaded me to go along with them, and I saw some of that Indian country.

By Mr. HOOKER:

Q. You mean the Colorado Utes?—A. Yes, sir. Those Indians had been treated with in 1873 for a portion of that very territory. I now allude to this fact as illustrating a general condition which I think you have to deal with. I think you are dealing with general rather than special cases. There are, I take it, about 2,500 Indians in Colorado on the Ute reservation.

INDIANS ON THE RESERVATIONS CANNOT BE PROTECTED.

By the CHAIRMAN:

Q. How many?—A. I think not over 2,500. I believe the report says 2,900, but from my observation I think there are not over 2,500. Those Indians owned, in 1874 or 1873, 12,000,000 acres in that reservation, and held it under treaty stipulation for their protection in their possession. The treaty of 1873 leaves it, perhaps, some two millions of acres less, 10,000,000 now. Ten millions of acres of territory for 2,500 Indians will be a very great disproportion, as you will see, in comparison to that occupied by the rest of the population of the country. I mention that as showing the lands which these Indians hold in these reservations by treaty stipulations. I assume that the nation is not going to protect the Indians in that. They are bound by treaty stipulations to do it, to be sure, but we all understand what that means, "so far as we can." I assume as a general proposition, incontrovertible proposition, which may be fortified by all our history, that you cannot protect these Indians on these reservations against the encroachments of the white settlers, and ought not to do it while their possessions are in such disproportionate excess to the whites. You make laws to allow a white man to pre-empt 160 acres, but allow the Indian by the treaty stipulations here 600 acres of land, it may be said. Everybody can see that the Indians' hunting-grounds practically come to an end, and suddenly, with influx into and spread of our population over those Territories. I assume that, in considering the Indian question from any standpoint you may be pleased to look at it, it will be obvious that the 76 Indian reservations in that country cannot be protected, will not be protected, ought not to be protected, in the interest of both races.

Growing out of that general fact is this obligation on the government—that is, not to exterminate these Indians; although now and then I have heard the statement that there was not a good, safe Indian—no, not one—but a dead Indian.

REMEDY FOR THE PRESENT CONDITION.

What is the remedy for this condition of Indians in the Territories? What shall we do with that 130,000 Indians that occupy, I think you will

find, about one hundred and eleven or one hundred and fifteen millions of acres of your domain on these seventy-six reservations, or about that in the aggregate. I am told that it is one hundred and fifty millions. The committee will understand that although in some sense I am giving evidence, I am rather giving conclusions. I have not examined the extent of this territory, but I suppose it from one hundred to one hundred and thirty millions of acres. You will see the great disproportion of territory in the hands of these Indians, and anybody can see at once that they are not to be continued in security in their possession. There is not adequate moral or civil power I think in the country to protect them in their occupation. There is no way that that can be done except by enlarging your Army and spreading it over these seventy-six reservations. If I am right about this from these general conclusions, then what is the duty of the government? It is to provide for them in some way. That provision, of course, will have to be made on the civil side of the government. Your Army may be used as a police force, and will necessarily be, but we have our treaty stipulations, a common humanity, and our good name would demand that we afford them protection. Now looking at the matter from this standpoint, you are to consider the question of the propriety of turning the management over to the War Department.

THE INDIANS SHOULD BE CIVILIZED.

The CHAIRMAN. That is the main object.—A. I suppose that would bear particularly on this point on the question of civilization. I assume that the committee would think it expedient and desirable, and the duty of the government, to provide, so far as lies in the Indians, that they should be civilized, and we should give them the benefit of civilizing agencies, whatever they are. Whether this instrumentality of war would be the better thing or not, is a matter for the committee to judge, but I do not know that I should venture an opinion upon that subject any further than the views that may be inferred from the position I assume. Taking that view of the subject, let us look at the whole question. Assuming that there are 300,000 Indians left (I think that perhaps 50,000 more than there will turn out to be, but that is indifferent so far as the argument is concerned), about one-sixth, perhaps a little more, are in the old States—the Eastern States. Of course I am not testifying with entire accuracy, but that is my supposition. Those Indians, it may be said, are pretty well to do, and might be left to themselves. The Indians are there being incorporated into the commonwealth, taking on the rights and privileges and duties of citizenship to some considerable extent; and, therefore, without going into detail, I assume you will allow that the Indians in the old States are rather well to do, and that the government will not be called upon to do anything more for them than its ordinary treaty stipulations call for. There are about 25,000 or 30,000, but a small portion, still, not exceeding 30,000, I think, in the five States in the far West, including Kansas—west of the Missouri.

The CHAIRMAN. A few more than that west of the Missouri River including Nebraska, Kansas, and Texas.—A. I do not mean that.

Q. And California and Oregon.—A. That makes six. I reckon there are about 30,000 of those. So far as Kansas and Nebraska are concerned, there are not more than 1,000 in Kansas. There are, perhaps, from 2,000 to 3,000 in Nebraska; but they are on reservations, and if the people treat them as the people in those States in the Northwest have treated their Indians, they are tolerably well provided for, and might be expected in due time with proper attention of this power, or otherwise on the part of the government—they might be expected to

incorporate into our population, so far as the probability of such a thing could exist. What I mean to say of those is that they are well cared for. Then what is left for the Indians in the Indian Territory and those that I have spoken of?

The Indian Territory may properly be said to be the only Territory where the Indian has a fee-simple right, except, perhaps, as qualified by the right the government obtained by the treaties of 1866 to purchase their lands, or a portion of their lands, at a reasonable consideration for the incorporation of other tribes into that treaty. Of course the government need have no great solicitude on their account if it performs its duties to the Indian Territory. So that the Indian question and the difficulties and perplexities growing out of Indian affairs, the onerous burden which falls on the government, and the very questionable policy existing, is chiefly with reference to those remnants of Indian tribes occupying these reservations. If you can settle that, in my judgment the whole Indian question will be finally settled.

LOCALIZE THE INDIANS.

By the CHAIRMAN:

Q. You would advise to lessen that number by some means?—A. I was going to say the remedy for this condition of affairs is, in my judgment, simply to localize these Indians. There is a Territory—the Indian Territory—which the Indians own. Since I have been in the Senate we have put into that Territory some twenty tribes, and all are peaceable, as a general proposition, and are very nearly self-sustaining. Assuming that we have 130,000 Indians on those reservations, that you cannot protect those reservations, that it is not for the interest of either party that they should be protected in them, then they should be removed and localized at some district accessible by railway where they can be protected. These 130,000 Indians would have ample space in the Indian Territory proper, and as a matter of fact all of the 300,000 which are not incorporated in the States where they are. That Territory is larger than all New England, which is supporting a population of five millions.

Q. You would advise putting them on one reservation?—A. I would do that if it were not for the difference of latitude. I doubt the propriety of taking the Indians from Oregon and the Territories far north suddenly into that country. If it were not for that, I would say the remedy is to put them upon that Territory that is ample, within striking distance of railway communication, and then put around them an exterior government with bayonets. I do not think we would have any difficulty. Those Indians would gradually become civilized and self-supporting. On the reservations where they are, their protection is impossible in my opinion, and that localization of the tribes is the obvious remedy.

COST OF THE PRESENT MANAGEMENT.

Now, coming to the economy of the thing, and that is equally imperative. Go into that country and you will be amazed at the extravagant expenditures—I do not mean reckless, but by force of circumstances. The Indians roam over one-half of our territory. My opinion, from considerable experience with the appropriations, is that the annual expenditures of the Army and of the civil service for this Indian service are little less than $30,000,000. Can it be questioned that locating these tribes, as suggested, would be an improvement in the way of expenditures, to say nothing of the lives lost in what I must conceive to be an ignoble warfare? It seems to me that on these considerations, and look-

ing at this question of the transfer as a remedy, that it can scarcely be said to be a remedy. A remedy is a treatment of the subject adequate to the removal of the difficulty. I cannot conceive that a transfer to the Army is to relieve us from the difficulties to which I have alluded.

Whether the civil side of the Indian service be transferred to the War Department or remain where it is, what is now taking place in the Indian reservations in the Territories will go on all the same if no other legislation be interposed to arrest it. That is inevitable. The Indian cannot be protected in it.

The general proposition is to convert these Indians to the state of civilization. They must acquiesce in it, and must convert themselves to it or they will be extinguished. That is the history of the world. That is their doom. I maintain that it is the duty of the government to interpose its authority and good offices for his protection and civilization. Our great nation can do that here to-day. The solution of this thing is simply to localize and protect these Indians. Put what you can in that Territory, where you have the right, and there is high example that left to themselves they can take care of themselves. They are tractable, and may be civilized and become self-sustaining and self-supporting, because some of those communities, you know, are really flourishing, somewhat wealthy, and well advanced in the ways of civilization, and I believe independent and self-supporting. I do not see why they all might not do that with fair opportunities; but in order to do that they must be diverted from their nomadic habits of life. That is for their interest, and that is our duty to do, whether they want it or not, and that, too, upon the highest grounds of humanity and morality. That is my belief.

A small matter of law of four sections would cure that whole evil.

THE INDIANS SHOULD BE PUT ON FEWER RESERVATIONS.

Q. You would advise that the Indians be put on fewer reservations?—A. Yes, sir; I would.

Q. That they be taken charge of by the Interior Department, caring for them, and teaching them the business of pastoral life and agriculture?—A. I should say, to put the whole thing in a sentence, put these Indians on fewer reservations. I mentioned the Indian Territory as the most desirable, for the reason that the Indians in that country want a fee-simple title to their property, and because they are in striking distance of the great commercial cities and can be supplied readily and protected, and the influences of our life would be right there. That is the principal reason for that. It may turn out after an experiment you will have to set apart an Indian reservation in the north for those in that region, and another in the south for Southern Indians. The Modocs lived north, and have been living there in the Indian Territory, and I believe are prosperous. I think any policy to be successful will abandon these reservations and localize them in this way. That is my remedy. If that is to be your policy, then, of course, there is no necessity of turning the service over to the War Department, as, in that event, it is to be hoped that the predatory warfare in these Territories will cease, the Army be released from the police duty it now performs, and the Indian be remitted by the law to the peaceful rights of the influences and the arts of civilization.

Mr. Chairman, you will excuse the desultory manner in which I have responded to your invitation to say something in relation to our Indian relations. You have my views as to the difficulties in this very difficult, very troublesome, very burdensome, and I do not like to use any stronger language, but I should say, so far as the nation is concerned,

almost reprehensible condition of Indian affairs. In point of absolute economy, I do not know of any branch of civil service that needs so much to be reformed. It can scarcely be conceived that the Government of the United States, under any circumstances, ought to be under obligations, past, present, or future, in regard to not more than 300,000 people existing in its domains, involving an annual expenditure of from $25,000,000 to $30,000,000, to say the least of it.

By Mr. HOOKER:

Q. You alluded in the course of your remarks to have been appointed on this commission to visit the Utes in Colorado?—A. Yes, sir.

Q. Did you go on that commission?—A. Yes, sir.

Q. You found the territory had already been circumscribed as you stated?—A. Yes, sir.

Q. By the cession of 1872 and 1873?—A. Yes, sir.

Q. Are you aware of the conformation of that reserve in Colorado and its geographical location?—A. Yes, sir; it is in Southeastern Colorado.

Q. And on the borders of the State?—A. Yes, sir; I believe it borders entirely on New Mexico.

Q. This portion which was ceded by treaty of 1872-'73 divides the Ute territory so that the northern and southern Ute territory is connected by a very small slip of land?—A. Yes, sir.

Q. What conclusion did your commission come to?—A. About the territory?

Q. Yes, sir.—A. If you will allow me to state generally, I did not go out with that commission, but being out in that country, a gentleman on the commission asked me to join it, and in obedience to that I did. I did not reach that territory. I was taken ill and staid until the balance of the commission went into that country and examined that matter, and then we all had a consultation. I examined the country very carefully. It is nearly divided, but not in the center, by the treaty of 1873. The treaty of 1873, I think, took about two millions of acres out of the southern portion of it, leaving perhaps four or six millions of acres below, or I should think about four millions.

Q. That is the southern portion of the territory. Is that the only portion suitable for grazing purposes?—A. That is much the better, unquestionably.

Q. Is not the northern portion valuable for its minerals?—A. That is the impression the commission received.

Q. Did you yourself go upon that territory?—A. I did not; I was taken sick.

Q. Give me the result of the commission's investigation.—A. The result was—but you will first permit me to state what the duty of the commission was, and——

Q. I know all about that.—A. The result was we could not make a treaty.

Q. Why?—A. The Indians would not agree to it.

Q. And declined to treat with you?—A. For the purpose of consolidating the two agencies into one; but they were not disinclined to treat for the southern end of their reservation; they would do that.

Q. Under act of Congress which authorized this commission nothing was to be done except according to the consent of the Indians?—A. No, sir; to consult or treat with the Indians and get their consent.

Q. Nothing was to be done without their consent?—A. No, sir.

Q. But whatever was done was then to be reported to the next ensuing session of Congress for confirmation?—A. Yes, sir.

Q. You have spoken generally in your remarks with regard to the fact

that the government is incapable or unable to defend the Indian Territory; taking this Ute territory for example, how do they hold it?—A. By treaty stipulations.

Q. They hold that portion of the land in consequence of a large portion which they ceded to the government and by treaty stipulations?—A. Yes, sir.

Q. To recur to the general question of the inability of the government to protect these Indian territories in the various States and Territories of the Union, what sort of power would you give the government to protect the Indian Territory proper; if the government cannot protect its treaty stipulations as to the reserves now existing, how protect the Indian Territory if desirable for American settlement?—A. In this way, that a fee-simple right is always much stronger intrenched in the law and principles of government than mere possessory and temporary right. The Indians in the Indian Territory are intrenched in the fee-simple right to that property.

Q. But suppose their territory should become desirable to white emigration, have you not heard the idea advanced that the government has the right to change all these treaties of statutory regulation?—A. I think they may. That is my opinion,

Q. Change the treaty stipulations without the consent of one of the parties to the contract?—A. I think that has been decided in the Supreme Court many times.

Q. If it should become necessary to occupy this Indian Territory, do you suppose it could be protected from the encroachments of the whites otherwise than by an army with bayonets pointed outward?—A. I think it could protect them very easily.

Q. It would require the protection of a cordon of arms with bayonets pointed outward?—A. I think that would be very conclusive; they could do that.

Q. You think it would be necessary to raise a force to protect the rights of the Indians in the Indian Territory?—A. I did not say that.

Q. I understood you to say you must have a cordon of arms?—A. That was by way of illustration; but it is impossible to protect these seventy-five reservations, because you would have to put so many armies about them. You could do it there in the Indian Territory, because it is small. I did not say that was the only way it could be protected, because I do not think so. And why? Because that country has been under the protection of the government without bayonets since 1836, simply by statute, which needs amendment for their protection, and the Indians have lived a very quiet life. They have been invaded at some points, but very little. As a general proposition, their country has been quiet, and I attribute that to the fact that it is understood that the Indians own their property.

Q. In point of fact, of these five civilized tribes occupying the main Indian Territory proper, their leading men and counselors, and chiefs or governors, are men of intelligence and capacity, and capable of taking care of themselves?—A. I think they are.

Q. With reference to the other reservations of the Indians, do you think it is proper that the government should permit any portion of these diminished reserves, like the Utes, to be taken from them except by their consent?—A. Yes, sir; I think I could state a condition of things where I think it would be the duty of the government to do it.

Q. Without the consent of the Indians?—A. Yes, sir; in their interest, and for a reasonable consideration, I think it would be the duty of the government to interpose and take it from them.

Q. And that applies as well to the other reservations and States and Territories as to the Ute Reservation?—A. Yes, sir.

Q. But excepting the Indian Territory?—A. Yes, sir; and, if you will allow me, whenever the government thinks it impracticable or inexpedient to attempt to protect them on the reservation, it is their duty to move them away from there, taking into consideration the rights and interests of the Indians, and move them to a place where they can be protected and civilized. My opinion is that it is utterly impracticable for the government to protect these Indians on the seventy-six reservations.

Q. Speaking of the transfer of the Indian management from the civil to the military authority, with the Secretary of War to have supervision over it, instead of the Interior Department, are you aware of the fact that military officers have been detailed to act as agents—as, for instance, at the Spotted Tail Sioux Agency, and some of those in that neighborhood—and that they have in every case conducted the affairs of the agency both to the satisfaction of the Indians and the government?—A. I think military men have been employed in many ways in connection with the Indians, and I understand with great satisfaction.

Q. Especially are they satisfactory to the Indians, because they kept faithfully their promises made to them. Is not that their history, so far as your observation goes, because of the validity and promptitude with which they kept their promises made to the Indians?—A. I cannot say what the sentiment of the Indians may have been. My opinion has been (and I have a very high estimation of the Army), that they are educated, and their manner of living depends, and their position and honor depend, upon their being men of honor, and they are, in a high sense.

Q. You think that would make them act with great honesty, if placed in that position, and that their education, and the fact of their holding a commission from the government, would give an assurance of an honest administration of affairs?—A. We might expect of a military gentleman what we would expect from any honorable gentleman generally.

JOHN YOUNG sworn and examined.

By the CHAIRMAN:

Question. Where do you reside?—Answer. Blackfeet Agency, Montana.

Q. Are you agent there now?—A. Yes, sir.

Q. How long have you been agent?—A. Two years.

Q. At what point are you located? Where is this agency?—A. In the northwest corner of Montana, close to the Rocky Mountains.

Q. What number of Indians are there?—A. Rather more than 7,000; three tribes, all under the name of the Blackfeet.

CONDITION OF THE BLACKFEET INDIANS.

Q. Have they been peaceable since you have been there, or have they had any difficulties with the government?—A. None whatever.

Q. What progress are you making in their civilization and in teaching them to labor and become finally self-supporting?—A. We have made some advancement in their civilization. There had been no attempt to farm at the agency when I took possession, and at first I could not get the men to work, but the squaws were willing, and aided me very much in small farming operations and also in reaping the crops; and the next year when I commenced, more offered their services than I could employ.

Q. Have they thrown off the blanket?—A. No, sir; about one-tenth of them have approached the civilized costume.

Q. Have you any schools?—A. A very good school.

Q. Are they inclined to attend?—A. Yes, sir; the children are very fond of it, and the parents approve of their attendance.

Q. Are they learning?—A. They are doing very well, sir.

INDIANS DESIRE TO BECOME CIVILIZED.

Q. You found them, then, disposed to take hold and become civilized people, did you? That is their disposition?—A. Yes; that is their disposition. They express themselves as being anxious to learn the ways of the white man and obtain their living as he does.

Q. Have you any troops in your neighborhood?—A. They are nearly 90 miles distant.

Q. Has this subject ever been talked of to these people, of placing military men over them instead of civilians as agents?—A. Yes, sir.

Q. How are they disposed to take to that?—A. They do not take it well. They are unanimous in wishing things to remain as they are.

Q. Are they fearful that the military would be overbearing, or what is it?—A. It is a strong feeling with them. They are of the tribes who were subject to Colonel Baker's punishment some years ago, and one band was wiped out. That terrible affliction came to them in war. They found the white man was too strong for them, and they solemnly promised to obey the white man; and they have done so to the present time.

Q. Some years ago the Indians were governed by military?—A. No, sir; I do not remember.

Q. Don't you know whether these Indians ever had the military over them?—A. None of the present men remember much about that. They were wild at that time.

THE TRANSFER SHOULD NOT BE MADE.

Q. What do you think about that yourself? You have had some knowledge of the Indians and their views. Do you agree with them?—A. I think it would be very injurious to them and to their progress in civilization to put them under the military rule.

Q. You think if let alone in the way you are managing it now, you will finally civilize these people without any coercive measures at all?—A. I do, sir.

Q. Are these Indians inclined to complain of the Indian agents they have had?—A. I think they have been imposed upon; not to any great extent, however. They don't make any special complaints.

Q. No complaint now?—A. No, sir.

Q. Have they annuities?—A. Congress appropriates $40,000 per annum for them.

Q. Is that received in money?—A. No, sir; in goods and provisions.

Q. Are the goods purchased by you?—A. No sir; by the Commissioner of Indian Affairs.

Q. And sent out there?—A. Yes sir.

Q. You have never made any purchases?—A. No, sir; except some few things to supply their immediate wants.

Q. Do you distribute money?—A. None at all, except in return for labor.

Q. Do you give the preference to the Indians when you have any labor to perform?—A. Yes, sir; invariably.

Q. They seem anxious to earn something for themselves, do they not?—A. They do.

BLACKFEET INDIANS HOLDING LAND IN COMMON.

Q. How do they hold their property; in common?—A. Yes, sir; all in common.

Q. Everything?—A. Yes, sir.

Q. What do you think about that? Is that advisable for all time to allow them to hold it in common; or do you think it would be better to divide it up and let them hold their property in severalty?—A. It might do in some portion of the farm lands. The reservation is for grazing rather than for farming purposes.

Q. How much land is there in the reservation?—A. I do not know exactly.

Q. How much of it is there in cultivation?—A. One hundred and fifty acres. That is about all the arable land in the valley in which I am situated.

Q. Do they raise vegetables?—A. Yes, sir.

Q. Are they raising no ponies or stock?—A. They have herds of ponies. Their wealth mainly consists of them.

Q. Cattle do not enter into their wealth?—A. Only a few; one here and there creeping into the management of that branch of industry.

Q. It could be introduced?—A. Yes, sir; the country is mainly suitable for it. There is no better grazing country in the world. Cattle can stay out all winter and get fat.

Q. Have you had any difficulty in getting your goods to you regularly?—A. Sometimes delays occur in going around through the mountains.

Q. How do you get your goods?—A. Up the Missouri, mainly from the East.

Q. Where are they landed?—A. Fort Benton.

Q. And then transported to your agency by wagon?—A. Yes, sir.

Q. How many acres are there in that reservation?—A. I can scarcely tell; it is pretty large.

Q. They consider that land as theirs?—A. Yes, sir; and are very sensitive of the encroachments of Congress made upon them.

By Mr. HOOKER:

Q. How long have you been there?—A. A little more than two years.

Q. You think 150 acres are under cultivation?—A. Around the agency; the small patches cultivated by the Indians here and there would probably swell it to 400.

Q. Four hundred and fifty acres constitutes the entire amount?—A. Yes, sir.

Q. You get $40,000, annuity?—A. Yes, sir.

Q. Under treaty?—A. No; not by treaty.

Q. By appropriation?—A. Yes, sir.

Q. What are the names of the three tribes?—A. Blackfeet, Blood, and Piegan. They are all really one people—the same customs, &c.

Q. What number?—A. A little more than 7,000.

Q. The appropriation made is $40,000?—A. Yes, sir.

Q. And that is entirely expended in provisions?—A. Yes, sir.

Q. Who preceded you?—A. John S. Wood.

By Mr. SCALES:

Q. I understood you to say that this 150 acres is all the arable land in the valley?—A. Pretty nearly so.

Q. And these patches carry it up to 400?—A. Yes, sir; little patches of five acres, and perhaps nine or ten acres.

Q. Is there any probability that the agricultural interests can be extended much beyond the 500 acres?—A. There are a great many other places on the reserve that are suitable for agriculture.

WASHINGTON, D. C., *December* 10, 1878.

General WILLIAM H. LYON sworn and examined.

By the CHAIRMAN:

Question. You are a resident, I believe, of New York?—Answer. Yes, sir.

Q. Please state to the committee what relations you have had to Indian affairs, and what knowledge you have had of the Indians. You have been connected officially, in some way, have you not, with the Indian Department?—A. Yes, sir; I am one of the Board of Indian Commissioners.

Q. Are you one of the board at present?—A. Yes, sir; I am at present one of the Board of Indian Commissioners.

Q. How long have you been in that position?—A. A little less than two years.

Q. During that time, have you visited or seen any of the Indians at their own homes?—A. I have; a few of them.

Q. What Indians have you seen?—A. I have seen most of the Chippewas, the different Sioux between Duluth and the Red River of the North, and from the Pacific Road to the Lake of the Woods, including the Mississippi band of "Pillagers" or Chippewas, at Leech Lake, and the Pembina band. Then, I have met the Sioux in the Devil's Lake Agency, and the Mandans, Arickarees, and Gros Ventres, of Northern Dakota; and some of the Arapahoes, and Shoshones, and Bannocks in Wyoming, and the Piutes, in Nevada. I have not been at these last-named agencies, however; the northern agencies are the only ones I have visited.

THE TRANSFER SHOULD NOT BE MADE.

Q. Well, now, sir, after all this experience and the observations you have made, what do you think of the plan that is proposed, to turn the management of the Indians over from the civil to the military department of the government; would it be to the advantage of the Indians or of the government to make the change?—A. I think not, sir, from what I have seen. And allow me to say that since my appointment I have been acting more particularly as one of the members of the purchasing committee, and have given my attention to the purchase of goods in New York.

Q. Goods that were to be shipped to the Indians?—A. Yes, sir. And from my observations among the Indians, I would as soon think of transferring the public schools of the city of New York to the police department of the city because we have a few unruly scholars and a few incompetent teachers, as I would to transfer the Indian management from the civil to the military department of the government; that is, in case the object is to civilize and make the Indian self-supporting as soon as possible.

INDIANS SHOULD BE CIVILIZED.

Q. Well, would you be in favor of civilizing the Indian and bringing him to a condition of self-dependence?—A. Most assuredly, sir. I regard them as human beings, and think them capable of being civilized.

We have plenty of evidence of that in the State of New York, where we have over four or five thousand Indians who are good farmers.

Q. What do you think of the condition of these Indians as you have passed around among them—are they improving in knowledge of affairs, so far as you could see?—A. In the northern agencies I visited I think they were, sir, perhaps with one exception. I visited one agency in which I thought the Indians were not improving rapidly, although I had never seen them before.

Q. At the agencies you visited were they teaching them farming or anything of that kind?—A. They were, sir.

Q. The Indians seem to take to farming, so far as you could see?—A. Yes, sir; particularly the younger portion of them. As for the old Indians, I do not think you can get them to work much, or civilize them to a very great extent, any more than you can transplant a forest tree and make it grow. A young tree you can transplant and it will be apt to grow.

THE INDIANS OPPOSED TO THE TRANSFER.

Q. Well, what did you learn from the Indians themselves, if anything, on the subject of the proposed change? Were they favorable or unfavorable to it, or was it talked about at all?—A. Yes, sir, it was talked about to some extent, and in every instance that came to my notice they were opposed to it.

Q. They prefer to have the civil to the military government, do they?—A. Yes, sir; and will you allow me to make a remark in regard to the military?

The CHAIRMAN. Yes, sir; and we would like to have any information on the subject of the transfer—whether it would be better to make it or not—that you may have.

The WITNESS. The mercantile part of the business, the purchase of goods, is the branch that I profess to have some knowledge of. I have the very highest respect for our military officers as officers, but I do not think that they are calculated to teach an Indian to split rails or hoe corn, or anything of the kind. Their education is of a totally different nature. I think that an Indian agent also should have a thorough practical knowledge of farming, stock-raising, &c. He should not only understand it, but be able to go out and take hold of the plow himself and show the Indians how to do it. From my knowledge of the Indians, you cannot *tell* them how a thing is to be done, they must be *shown* how to do it; and the agent should be able to do it himself. He may have a farmer to help him; but in my own business, I could never get along, at least I think I could not, if I did not know myself how to direct my subordinates. It is not a prejudice I have against the Army at all, but I think they are not competent to take charge of Indian agencies; their education is in a different line entirely; they are not calculated for it on this account. As a business man I employ agents all over this country—in fact, in every leading city on the globe; and I want the best ability I can get; but I never would think of employing an Army officer in my particular business, because he would be unsuited for it. If I wanted a farmer I would not choose an Army officer; his education is in an entirely different line. Army officers can be used, however, as inspectors of agencies. They have these inspections of agencies once a year. I think that that is quite insufficient; they ought to be inspected once a month—perhaps not quite so often as that, but more than once in a year. A military officer would do very well, perhaps, in that capacity; but having, as I said, a real respect for the military, I will say that I think a great nation like ours ought not to be so ungenerous as to ask an officer who

has devoted the best part of his life to securing an education as a soldier to act as an Indian agent, for the nation has plenty of business for them without asking them to take such positions.

AGENCIES TOO LARGE.

Q. What would you think of the plan of reducing the number of agencies, of consolidating them?—A. I was going to say something on that point. I think that the reservations are altogether too large. From the reports we have of the number of acres, I think it would average five or six hundred acres for every man, woman, and child among the Indians. I think that some of these reservations, at least, are too large. I think that many of these agencies should be consolidated, and that a good practical farmer, a man of practical knowledge, should be appointed as agent. I am half inclined to think that in some instances an Indian agency has been considered an asylum, perhaps, for decayed persons of some kind. I object to that. I think it requires the very best ability of a certain kind—agricultural ability, for instance. You ought to have a good practical man as agent, and let him have clerks to do the mercantile part of the work.

INDIANS AS RAIL-SPLITTERS.

By Mr. SCALES:

Q. How long have these agents been teaching the Indians to split rails?—A. Well, I am unable to say. The State of New York, I think, for more than a generation—for twenty-five years and more; and we have in that State several thousand Indians who are civilized, and have good farms, and many of them are as good farmers as we have in the State.

Q. Have we not been attempting, through agents, to teach the Indians to split rails ever since 1802?—A. I presume so, sir; perhaps for a longer time than that.

Q. Will you tell the committee, general, what proportion of the Indians can now split rails, and do split rails, so far as your knowledge and information go?—A. I cannot, sir; I merely mentioned splitting rails as a part of the business of farming generally.

Q. What proportion of them do you think employ their time in agricultural pursuits? I refer to the Indians in charge of the Indian agents in the United States.—A. Well, I am not prepared to answer that, sir.

Q. One-half or one-third? Speak from your general knowledge. I do not urge for an exact answer.—A. I should think a half.

Q. You think that one-half the Indians are following agricultural pursuits, or are being taught to follow agricultural pursuits?—A. Yes; I know that they have been trying to teach them, and a great many of them have been taught and are now following agricultural pursuits; I should think one-half.

Q. You should think one-half of the Indians on the agencies?—A. Yes, sir.

By Mr. STEWART:

Q. I would like to ask you, general, what church you represent in the Board of Indian Commissioners?—A. Well, doctor, I was not appointed by any religious denomination. If there was such an organization as the church of humanity, I should say I represented that. But I was not appointed or selected by any religious denomination; but supposing that my experience in business for over thirty years in New York would be of some benefit to the commission, I was appointed to assist them in the purchase of goods.

RELIGIOUS MANAGEMENT OF THE AGENCIES.

Mr. STEWART. Well, the church of humanity is a good church to be represented. What is your idea, general, of the religious management of these agencies; would you throw them open to all religious teachings, or would you have them confined to one denomination?—A. I am more of a business man than missionary; I do not know that I could answer that properly. The missionary work is an excellent work, but I think the Indians should be taught to labor, and to be self-supporting, and the missionary work should be attended to primarily on the Sabbaths. I do not know that it would be of any use to have many denominations on the same reservation. I should think it would not be well. At all events, it is an entirely separate business from teaching the Indians to work. The missionary work, in my judgment, should be attended to the same as it is attended to anywhere else.

Q. You would make it secondary, then?—A. No, first; on the first day of the week. The missionary should take the Indians on the Sabbath and teach them the principles and truths of religion, and the farmer should take them on Monday, and all through the week, and teach them how to support themselves by labor. But in regard to the missionary work, and religious teaching, others can give you more and better information than I can.

MANNER OF PURCHASING UNDER THE TWO SYSTEMS.

Q. Certain questions have arisen in the course of this investigation, general, in regard to the advantages on the part of the Army in the purchase of supplies for the Indians. Now, if you have been in business for thirty years, and are a practical man, you can tell us whether there are any advantages on the part of the Interior Department in making its purchases that the Army would not have. If so, we would like to know what they are.—A. Well, I should claim that, being a merchant, I would have the same advantage over an Army officer in purchasing goods as an Army officer would have over me in some other respects. To be sure, the goods are advertised for. The Army advertises for proposals, the same as the Indian Department does. The bids are opened probably in the same way. Well, now, a merchant, if he understands his business, should know the value of these goods, and if, as sometimes happens, the lowest bid offered is twenty-five per cent. more than the goods could be bought for in open market, the merchant would know it, when the Army officer would not, and it would be his duty to reject all the bids, and buy in open market. That has been my case, when I have had charge of the business. An Army officer, not knowing the value of goods, would be more apt, I think, to take the lowest bid, which would be a mistake in some instances.

Q. Well, is not that the case sometimes?—A. I believe it is.

Q. Is not that the law?—A. I do not think it is the law.

Q. Are you allowed to buy in open market?—A. You are allowed to if the bids are higher than the goods can be bought for in open market.

Q. Have you ever purchased in open market under such circumstances?—A. I have, sir.

DUTIES OF THE BOARD OF INDIAN COMMISSIONERS.

By Mr. HOOKER:

Q. What is your position now, General Lyon?—A. I am a merchant in New York.

Q. What is your position on the board of commissioners?—A. I am one of the board.

Q. What are your duties on that board?—A. I am a member of the purchasing committee of the board.

Q. How many are there of you?—A. On the purchasing committee?

Q. Yes, sir.—A. Four.

Q. What are the duties of the purchasing committee?—A. They are these: The goods needed for the Indians are advertised for by the Commissioner of Indian Affairs; the bids are to be opened at a certain date. We open them. They are usually opened by the Commissioner in the presence of the whole board of commissioners—the purchasing committee particularly—and the awards are made after due consideration. If any of the bids are too high—higher than the goods can be bought for in open market—the bids are rejected and the goods are bought in open market.

Q. By whom are they bought?—A. By members of the purchasing committee.

Q. By these four members of the purchasing committee?—A. Yes, sir; by all of them, or by some of them, under the direction of the Commissioner of Indian Affairs, or in connection with him, rather.

QUALITY OF GOODS PURCHASED.

Q. Have you known of any instances in which the goods purchased, either by contract and the acceptance of bids or in open market, in which they have failed to be of the quality represented when delivered?—A. Well, I think I have known some instances; yes, sir.

Q. How many instances?—A. Very few, sir; very few indeed since I have been on that board. There have been only two openings since I have been a member of the board.

Q. What are these instances, do you remember, and what contractors furnished the goods that were found not to be of the quality contracted for when delivered?—A. I cannot tell.

Q. But you know that the goods were not up to the samples?—A. Yes, sir; the goods were not up to the samples and were rejected.

Q. The goods, after the bids were accepted, came in and were not up to the sample, do you mean?—A. No, sir. I mean after the goods reached their point of destination, at the Indian agencies, they failed there to correspond with the samples furnished.

CONDITION OF AFFAIRS AT THE CROW AGENCY.

Q. Any instance since you have been on the board?—A. There was an instance, last season, at the Crow Agency. The report came from an Army officer that the blankets were poor, and the clothing poor, and the oats were poor, and nearly everything was stated by this officer to be of poor quality.

Q. What officer?—A. It was at the Crow Agency.

Q. An Army officer?—A. Yes, sir; he reported the goods as poor.

Q. What action was taken?—A. The Commissioner ordered samples of these goods to be sent back by express, and they were directed to my care in New York. I had the samples of all the goods we had awarded from the season before. We opened the goods and compared them with the samples that they were awarded from, and we found them to be exact in every respect. The Army officer was right in saying that the goods were poor compared with the goods that the military receive, but we are obliged to have our goods cut according to our cloth. We labor under serious difficulties in regard to the appropriations; they are not large enough, and they are not made early enough. I will state that.

Q. The Army officer, in this instance, reported all or nearly all the goods as of poor quality?—A. Yes, sir.

Q. Are the goods—food, clothing, &c.—purchased for the Indians poorer than those purchased for the Army?—A. I do not know that, sir. We are not so particular in purchasing clothing as the Army is; for instance, we require, more particularly, warmth and durability in the clothing, and are not so particular as to the material, whether it is of Army blue or Navy blue, or of any other color, so long as it has warmth and durability. So far as the food is concerned—the beef, flour, sugar, &c.—I think they are as good; but the clothing costs less, and the material is not as good, perhaps; I will not pretend to say.

Q. Is it not the case generally—or does your information extend to that—that the character of the beef furnished to the Indians is of a poorer quality than that furnished to the Army?—A. I am not able to say, sir, as I have paid particular attention only to goods purchased in New York. I do not know much about the beef.

Q. In your visits to the various agencies, you did not make inquiries on that subject, and I do not know.

ARMY OFFICERS AS INSPECTORS.

Q. It is the duty of the military officer, when called upon by the agent, to make an inspection, is it not?—A. Yes, sir; of the goods when delivered; to check off the invoices, &c.

Q. And that inspection is established by the government with a view to detecting any difference between the goods as sent, and the samples furnished, is it not?—A. Yes, sir; and if the Army officer does not have the sample there, he ought to have it. We have been in the habit of sending out special agents to take the samples, and have required the agents to send them back to us, to see that the goods correspond with the samples.

Q. Well, that was the purpose of establishing this inspection by Army officers, was it not?—A. Yes, sir; that was the object, I believe. The goods should be checked off as a business man would check off his goods. I never would allow one man alone to check off a bill of goods, without its being looked after, for fear of mistakes.

Q. For fear of what, sir?—A. I speak of my own habit in business. I say that I would not in my own business allow an invoice of goods to be examined by one person alone; it must be checked off by a second party. I would not trust myself alone to do it. I would not allow a bookkeeper to pay a bill from my checking alone, for fear that I might make a mistake.

AN AGENT SHOULD HAVE A PRACTICAL KNOWLEDGE OF FARMING.

Q. You mention the character of man that in your judgment ought to be appointed an agent, and you stated that you did not think any Army officer would make a good agent; that the agent ought to be a farmer?—A. Yes, sir; he ought to be a man who possesses a practical knowledge of farming, stock-raising, herding, &c.

Q. Are you aware of the fact that many of the agents appointed do not possess those characteristics?—A. Yes, sir; I am aware of it.

Q. They are not appointed, then, with reference to the qualities that you deem essential in an Indian agent, under the present system?—A. They are not, sir, in many cases, men whom I would employ in any capacity whatever; they are the same, in that respect, as military men, whom I would not employ in my business.

Q. Well, General Lyon, if the treaty stipulations with the Indians

were observed, and the various employés now at their posts were retained, and officers assigned to duty as military agents, would you see any difference in the conduct of the post?—A. Let me understand that, sir.

Q. I say, if the same men now employed, the employés of the post, as they are called, were kept in their positions by the military officer who was assigned to duty as supervising general of the agency, would you see any difference between that and the present system?—A. Well, I do not think that any Army officer is qualified by inclination or education, or anything of the kind, to conduct the business of an agency; and I understand you to ask me if I think they would do as well as the present agents?

Q. Yes, sir; you say the present agents are incompetent.—A. Well, there are exceptions; I do not include them all; there are many good agents—first-class men.

Q. And there are many incompetent?—A. Yes, sir; there are many incompetent; and there are undoubtedly some very dishonest ones; but my experience has shown me that there are more agents who fail through incompetency than through premeditated dishonesty.

Q. Are you aware of the fact that by the request of the Secretary of the Interior two officers were detailed from General Crook's command, in the Department of the Platte, to take charge of the Spotted Tail Agency, and that they remained four years as agents?—A. That was before my connection with the board of commissioners.

Q. Then you were not aware of it?—A. Not sufficiently to form any opinion in the matter.

Q. You only, then, refer to Indian matters in connection with your duties and experience as purchasing-agent under the contracts which have been let out by the department?—A. Yes, sir; that is the correct idea; my duties related more particularly to the purchasing of goods.

Q. Well, sir, I have nothing more to ask.

By Mr. BOONE:

Q. You have stated that in your opinion an Indian agent ought to be a man who is thoroughly acquainted with the business of farming or teaching, or whatever else he might be called upon to do as agent?—A. Yes, sir; he ought to understand it.

Q. A man of first-class ability?—A. Yes, sir; of practical knowledge as an agriculturist.

Q. A farmer and practical man?—A. Yes, sir; a man of that kind.

Q. Now state, if you please, whether or not this has been the character of the agents that have been appointed by the Interior Department.—A. It has not been in some instances.

Q. What proportion of these, in your opinion?—A. Well, as far as I am able to judge, having visited only a very few of the agencies, I could not say as to that. I have met some excellent agents—for instance, Father Wilbur, as he is called. He is a practical man. I think he is one of the best agents in the service.

Q. He is a minister, I believe?—A. I believe he was a minister; but he is also a farmer, and can hold a plow, and teach and show the Indians how to work and become civilized men.

Q. Now, is it not a fact that very few agents whom you have observed are of the class of men that you have described as being proper agents?—A. Well, from a business point of view merely, and I am looking from that standpoint, I should say that a majority of those I have seen have not been. I do not think the problem is a difficult one to solve, if the

end in view is to civilize the Indians and teach them to become self-supporting. If this aim is kept before the agent, and the methods employed are in keeping with true business principles and methods, there need be no great difficulty in the way.

Q. Well, that is what I wanted to find out, who make good agents; I wanted, from your experience, to learn, if possible, whether the class of men who are now acting as agents under the present system are the class whom you would chose as good agents?—A. Some of them are not, sir. I would not employ them in any capacity whatever.

Q. Are there not many agents that do not, by personal example, undertake to teach the Indians at all in farming, or anything else in agriculture, but rely exclusively upon the employés about the agency?—A. I have no doubt of that, that there are quite a number of such agents.

Q. Then you would state that these agents have not been selected, in all cases, from men who are qualified for that sort of business?—A. Yes, sir; not so selected, from my standpoint.

The CHAIRMAN. That is all, general; I am obliged to you.

BARCLAY WHITE, affirmed and examined.

By the CHAIRMAN:

Question. Where is your residence, sir?—Answer. Mount Holly, N. J.

Q. I believe, Mr. White, you have had considerable experience for a number of years with Indian affairs, as connected with an agency superintendency, or something of that kind?—A. Yes, sir; I was superintendent of Indian affairs of the Northern Superintendency from 1871 to 1876. I have since been special Indian agent for the Society of Friends, and hold that position now.

Q. There are two branches of the Society of Friends; to which branch do you refer?—A. To that known as the Hicksite branch.

Q. Your connection was mainly with the Indians in Nebraska, was it not—that is, after you became the representative of your society?—A. Yes, sir; I was a resident of the city of Omaha for nearly five years; my headquarters as superintendent were in that city.

Q. Will you please state to the commission, Mr. White, your opinion of the management, as to whether it would be better to change the management from the Interior Department to that of the War Department; whether any advantages would grow out of it to the Indians or to the government?—A. I noted down last evening, in writing, the condition of the tribes that were under my care as reported by the Commissioner of Indian Affairs, and other agents, in 1868, and also the condition of the same tribes as I know it to be in 1878—the present year. If it is satisfactory to the committee I will read these notes.

Q. Are they lengthy?—A. No; they are short.

Q. Very well; we will receive them. [Reading.]

A comparison of the situation of the Indians composing the late Northern Superintendency as regards civilization and self-support, during the years 1868 *and* 1878.

Soon after his inauguration President Grant placed this superintendency and its constituent agencies under the care of the Religious Society of Friends, and its superintendents and resident agents have in all cases since, until very recently, been nominated by that society.

Samuel M. Janney, its first superintendent, entered into the government service May 27, 1869, and the agents nominated by the society commenced office about the same period of time.

SANTEE SIOUX IN 1868.

Referring to the commissioners' and agents' report for this year, it appears that the Santees cultivated 340 acres of land, occupied 65 log-houses, raised 6,000 bushels of corn, but no wheat, or other agricultural production; had no school of their own—were dependent upon mission-schools; had no mill or Indian mechanics.

SANTEE SIOUX IN 1878.

Three hundred and sixty-four persons, members of this tribe in 1868, have abandoned tribal relations, and established themselves at Flandreau, Dak., as citizens of the United States. All members of the tribe wear citizens' dress. They have an industrial boarding-school in addition to mission-schools. Have a good stone water-power flouring-mill. All Indian children of school age are in school at some period of the year. The tribe has deposed its hereditary chiefs and now elects, by the votes of the people, two counselors in each of four elective districts, who are the representatives of their district, and of the tribe, holding office for two years, or during good behavior. The farmer Indians cultivated and harvested sufficient agricultural produce for the subsistence of all. Government rations are issued weekly to the Santees, they being entitled to them as a constituent portion of the Sioux tribe. The agency clerk, miller, blacksmith, teamsters, and herders are all Indians, doing full and satisfactory service. The majority of the members of the tribe have joined Christian churches. Three hundred Santees read English understandingly. They have 1,000 acres of land under cultivation. Their lands are allotted in severalty, but held only by a certificate of occupancy. They live in 5 frame and 119 log houses, and generally use chairs, tables, plates, knives and forks in their families.

WINNEBAGOES IN 1868.

At this date the Winnebagoes were governed by 14 hereditary chiefs, and with the exception of fifty persons, the tribe was living on a space four miles square, in the timber. Ten acres of wheat and 6,000 bushels grown on 300 acres were their agricultural crops. Food rations were weekly issued to them, costing annually from 25,000 to 28,000 dollars; none of them understood mechanical trades. Two schools were established among them in 1868, and one female taught both, devoting half of the day to each.

WINNEBAGOES IN 1878.

The Winnebagoes now have a republican form of government, electing twelve chiefs annually. The tribe is self-supporting; no subsistence rations are issued to them, excepting half a pound of flour for each day's attendance, to the parents of such children as attend a day-school five days in the week. This is issued only as an encouragement for attendance. They have a brick industrial school-house and three day-school-houses; 15 brick dwelling-houses, 25 brick and frame dwelling-houses, and 85 frame dwelling-houses, occupied by Indians. Their lands are allotted in severalty. During the year they gathered from their farms agricultural crops as follows: 8,000 bushels of wheat, 30,000 bushels corn, 1,000 bushels oats, 5,000 bushels of potatoes, with large quantities of vegetables. The men generally wear citizens' dress and are in demand among the white agriculturists of Iowa and Nebraska, as harvesters, wood choppers, and farm laborers. The agency engineer, blacksmith, carpenter, and shoemaker are Indians and there are numbers of skilled mechanics

in the tribe, not now in government employ. Many of the Winnebago farms are as skillfully cultivated as are those of white men. One hundred and seventy-five Winnebagoes read English understandingly.

OMAHAS IN 1868.

Governed by hereditary chiefs. Their subsistence derived from corn meal, semi-annual buffalo hunts, and an annuity payment to them in cash. Nine hundred acres of land cultivated; producing 100 bushels of wheat, 20,000 bushels of corn, and 500 bushels of potatoes. Twenty frame and 30 log houses occupied by Indians.

OMAHAS IN 1878.

A steady increase in the tribe's population during each of the last ten years. A majority of the tribe asking for a republican form of tribal government. Lands allotted in severalty; buffalo hunts abolished; 2,200 acres of land cultivated by Indians, producing 17,000 bushels of wheat, 32,000 bushels of corn, 1,200 bushels of oats, 6,000 bushels potatoes and great quantities of vegetables; being a surplus over the quantities needed for tribal subsistence. Two day-schools filled with pupils. No furs sold. Fifteen frame and 80 log houses occupied by Indians. One hundred and thirty-five Omahas read English understandingly.

PAWNEES IN 1868, IN NEBRASKA.

This tribe was subsisting principally from semi-annual buffalo hunts; 900 bushels of wheat was grown for them by the government; crop of corn destroyed by locusts; no Indian farm excepting squaw-patches; 65 children reported in school; 8 frame and 3 log houses on reserve, principally occupied by white employés.

PAWNEES IN 1878, IN THE INDIAN TERRITORY.

They have one stone industrial boarding school-house for 80 pupils, lately erected; 2 day-schools with 103 scholars; 2 frame and 24 log houses occupied by Indians; 960 acres of ground cultivated by Indians, producing 8,000 bushels of corn and 400 bushels of oats. The Pawnees have lost by death during acclimation, in three years' residence in the Indian Territory, about one-third of their number. They are as docile and capable of civilization as our other tribes, but suffered by continuous raids of Sioux upon them while in Nebraska, and from sickness since removal to the Indian Territory, which causes have very greatly retarded their proper development. One hundred and twenty Pawnees read English understandingly.

OTTOES AND MISSOURIAS IN 1868.

No school. No grain raised. The tribe subsisted by semi-annual buffalo hunts and payments of annuity in cash.

OTTOES AND MISSOURIAS IN 1878.

They have one industrial boarding-school with 43 scholars on the register. Sixty Ottoes read English understandingly. Five hundred acres of land were cultivated by Indians, either as home farms or by days' labor for the government, producing 1,700 bushels of wheat, 6,000 bushels of corn, 900 bushels of oats, 800 bushels of potatoes, with large crops of other vegetables amply sufficient for the subsistence of the entire tribe. The Ottoes have ceased hunting buffalo, having now a large herd of domestic cattle, the increase of which is used for food. Their annuity

is deviated from a payment in cash to an expenditure on their account for agricultural, educational, and other beneficial purposes.

By the CHAIRMAN:

Q. When you speak of the Missourias you do not mean the State of Missouri?—A. No, sir; that is the title of the tribe. It is spelled r-i-a, Missouria.

Q. I am aware of that. I saw that you used the word Missourias to the Ottoes also.—A. It is the Ottoes and Missourias. They are on lands in Kansas and Nebraska, about fifty miles from the Missouri River.

By Mr. STEWART:

Q. Were all these tribes within your jurisdiction?—A. They were until the Pawnees were removed to the Indian Territory.

The CHAIRMAN. When you use the word Missourias you do not mean the State of Missouri?—A. No, sir; none of these Indians are in the State of Missouri. That is their title.

The CHAIRMAN. That is all I wanted to have explained to the committee.

The WITNESS (continuing):

IOWAS IN 1868.

They had one day-school, the teacher of which reported, "It is impossible to advance the children in the rudiments even of an English education, to any satisfactory extent, when neither teacher nor pupil can make themselves understood, except it be through the medium of an interpreter." Seven frame and 16 log houses occupied by Indians. No wheat, 3,000 bushels corn, and 600 bushels of potatoes grown.

IOWAS IN 1878.

One industrial boarding-school, in which all the children of school age, one only excepted, have been in attendance during some period of the year. Seven hundred and fifty acres of land cultivated by Indians. Every Iowa family that possesses the means of cultivating it has a fenced field or farm. The Iowas have planted, cultivated, and properly cared for 1,600 fruit-trees and 300 grape-vines; have harvested 1,441 bushels of wheat, 32,000 bushels of corn, 300 bushels of potatoes, and large quantities of other vegetables, sufficient in quantity for the subsistence of the tribe. One hundred and ten Iowas read English understandingly.

SACS AND FOXES OF MISSOURI IN 1868.

They had no school, and cultivated no agricultural crops, but in a limited number of squaw-patches. Their subsistence was chiefly derived from the chase and proceeds from semi-annual payments of cash by the government.

SACS AND FOXES OF MISSOURI IN 1878.

They have an industrial boarding-school, which the majority of children of school age attend. Four hundred and fifty-three acres of land are cultivated by members of the tribe, producing 399 bushels of wheat, 8,000 bushels of corn, 446 bushels potatoes, and other vegetables in proportion. Sixteen Indians can read English understandingly.

CRIMES.

Since 1871, no Indian belonging to the above-named tribes has been accused of the murder of a white person, nor has been guilty of any bel-

ligerent act that could not be controlled by the tribal government. During the same period of time, three Sioux, two Winnebagoes, and one Omaha Indian have been wantonly murdered by white men who have not in either case been punished for the crime. The Indians of the tribes have not retaliated upon the murderers or other white persons.

THE MILITARY AS PROTECTORS OF INDIANS.

From 1871 to 1876 the superintendent of these tribes only upon one occasion called upon the War Department for assistance. The greater portion of the Pawnee tribe of Indians removed to the Indian Territory in the autumn. It was thought best to retain the aged persons and boarding-school children in Nebraska until the next spring. They were fearful of raids from the Sioux, and, when two members of the Board of Indian Commission visited them, asked that a company of soldiers might be stationed at the agency for their protection. The commissioners laid the subject before the superintendent and he joined them in an application to the commanding officer of the Department of the Platte. A small squad of soldiers was stationed at the agency. While they were there a raiding-party of Sioux entered the Indian village and killed the wife of Eagle Chief. No pursuit was made by the soldiers, although the Indians offered them ponies for that purpose. Two days after the soldiers left, a raiding-party of Sioux again entered the village and killed a young man. The presence of soldiers on this occasion was of no value or protection to the Pawnees. The late superintendent of these tribes has found in his experience that a properly organized, officered, and paid Indian police force, in the hands and under the control of a proper resident agent, who will manage them with firmness, is amply sufficient and competent to preserve order, return wanderers, and arrest the criminals in the tribe.

THE TRANSFER SHOULD NOT BE MADE.

By the CHAIRMAN:

Q. Then I understand you to say that you do not think it would be for the best, or better the condition of the Indians, to have the change made?—A. So far as my experience extends, I think it would be a very great disadvantage to the progress of the Indians.

Q. The Indians themselves you understand to be opposed to it?—A. So far as I have had access to their opinions, the Indians are unanimously opposed to it, unless they see some selfish interest in the change.

Q. What selfish interests do you refer to?—A. A few instances, I think I have met, in which they thought it would be to their interest to be employed as scouts, if the military had charge over them. They are the only instances I have known where I have not found the Indians decidedly opposed to the transfer.

INDIANS WILLING TO WORK.

Q. You say that great progress has been made by these Indians. Have they entered into the spirit of it; do they show any anxiety to work, and do they do it willingly and cheerfully; or do you have to induce and compel them to perform the labor required of them?—A. There is not one of these seven tribes of Indians in which there is not a much greater demand for labor than the agent has ability to employ, on account of the want of means. There are applicants continually for labor that cannot be given to them.

Q. What do you think, Mr. White, of the propriety of keeping the Indians that are in the north, in the north somewhere; that is, of fur-

nishing them a reservation somewhere in their own latitude, where they were raised. Do you think it is proper and right to send them down into the southern country?—A. I do not. My experience with the Pawnees leads me to believe that it is inhuman to send northern Indians to the Indian Territory.

Q. You would advise, then, that the Indians of the north be located on northern reservations?—A. Yes; in the same latitude, somewhere, in which they have been used to living.

Y. Well, what would you think of the propriety of consolidating more of the tribes than we have done? It has been done to some extent lately, I believe, but would it not be less expensive to the government, at least, if the tribes were brought on fewer reservations?—A. I think it might be more economical as far as the footing up of expenses is concerned; but I think it would not be true economy—not in the tribes with which I am connected—to effect such consolidation.

INDIANS SHOULD HOLD THEIR LANDS IN SEVERALTY.

Q. Well, what would be the plan you would suggest? Would it be to hold property in severalty, as white people do, or allow them to remain in their tribal relations?—A. Could there be an act of Congress passed allowing the Indians to homestead the lands in their reserve and hold the title in fee without the power of conveying it for probably a generation, until the younger members of the tribe were educated in financiering, I think it would be the best legislation that could possibly be made for the promotion of civilization among the Indians. They are not now educated in financiering sufficiently to allow them to retain lands that are given to them now in fee. They are not ready to become citizens of the United States. If they could be held as wards of the government, and yet hold the fee of the land, so that they could not be by the voice of their chiefs dispossessed of the title, it would promote industry. They now feel unsettled. They feel that they have no abiding place. They are subject to be removed by the higher powers, and they do not feel that they have a home. If they did, or could feel that they had that home secured to them, my opinion is that a majority of these Indians would take hold with great interest and zest, just as white people do who desire to make a home for themselves.

By Mr. SCALES:

Q. Where did you get the statistics that you read this morning?—A. The statistics for 1868 I derived entirely from the published reports of the Commissioner of Indian Affairs and of the agents of the tribes annexed to the report of the Commissioner of Indian Affairs as presented to the President and published for that year.

Q. Where did you get the statistics for 1878?—A. I got them from my own records as superintendent of Indian affairs for five years, and from the records of the previous superintendent, and from my experience of the last two years. I have visited all these tribes. I spent about five months last summer and the previous summer visiting these tribes as agent of my religious society, to see that the agents were doing their duty and to see that the Indians were progressing properly.

Q. These facts are not then within your personal knowledge?—A. They are within my personal knowledge.

Q. These facts of 1878?—A. Yes, sir.

Q. You have ascertained for yourself the number of houses occupied, the number of acres cultivated, and the number of bushels of wheat and corn raised?—A. The houses in some of the tribes were built by contract.

Q. The question I ask you is, whether these things are within your personal knowledge—whether you have gone on the ground and ascertained them for yourself?—A. I have not gone over the reservations and counted the houses.

Q. You took the number, then, from somebody else?—A. I approved the contracts for building almost all these houses on some of the reserves while I was a government officer. I know they were built from that fact, although I did not count them all, and probably have not seen them all. From the reports of agents to my office, and from reports of agents since I have been out of government employ, and from my personal knowledge and observation, I arrive at the number of these houses.

By Mr. HOOKER:

Q. What position do you occupy now, Mr. White?—A. I am special Indian agent for the Society of Friends.

Q. I mean what position under the government?—A. I have no government appointment.

Q. You simply act for the Society of Friends?—A. Entirely for that society.

Q. What particular portion of the Indians have you under your supervision?—A. These seven tribes already alluded to.

Q. And they are all in the State of Nebraska, with the exception of the one you referred to as having been removed to the Indian Territory?—A. Yes; the Pawnees; and the reservations of three of the tribes lap over a short distance into Kansas.

CONSTRUCTION OF BUILDINGS FOR THE WINNEBAGOES.

Q. You referred to the condition of the Winnebagoes, and of the construction of a certain number of houses. You say you had supervision of the contracts for building?—A. The contract was made by the agent and approved by myself.

Q. What agent?—A. Some of them by Agent White and some of them by Agent Bradley.

Q. Agent White is your son?—A. Yes, sir.

Q. And Agent Bradley preceded him?—A. Yes, sir. Agent Bradley occupied an intermediate appointment. Agent White had charge for four years, when he resigned, and Agent Bradley succeeded him; Agent White was then reappointed.

Q. All these appointments and resignations were recommended by your Society of Friends, were they?—A. Yes, sir.

Q. With whom did you make your contract?—A. The contract for building most of these houses, I think, was with A. B. Fuller, of Dakota City, Nebr. I think he received one, if not two, contracts for building these Indian houses.

Q. How many houses were built?—A. My impression is that one contract with Fuller was for the construction of fifty. There was afterward a contract made by Agent Bradley with a gentleman at Fort Calhoun; I do not remember his name. He constructed the brick and frame houses.

Q. Who did?—A. This gentleman at Fort Calhoun.

Q. How many of these?—A. I think twenty-five of them.

Q. Making, in all, seventy-five?—A. Yes, sir; seventy-five of these.

Q. Were there not more than that constructed?—A. Yes, sir; there have since been constructed by Agent White, after I retired from the Northern Superintendency, the brick houses; they are entirely of brick.

Q. You mean residences for the Indians?—A. Yes, sir.

Q. How many of these?—A. The number is stated in the paper I read.

[Mr. BOONE. It is stated at fifteen.]

Q. Aggregating in all, how many?—A. I think (counting) about ninety.

Q. What amount was paid for each one?—A. I cannot state definitely. I think it was in the neighborhood of $660. They varied with each contract, but somewhere between six and seven hundred dollars apiece.

Q. Out of what funds were these buildings paid for?—A. Out of the trust-funds of these Indians.

Q. Amounting to what?—A. The first number of houses were paid for out of the principal of their trust-funds, under an act of Congress.

Q. What was the amount of their trust-funds?—A. Their trust-fund at that time was somewhere a little over a million of dollars.

Q. In point of fact, how much did they take out of the trust-fund to build the houses?—A. They took only the amount of the contract, whatever that was, definitely.

TRUST-FUNDS OF THE WINNEBAGOES.

Q. Did not they take two hundred thousand dollars out of this trust-fund to build these houses?—A. If I remember rightly, by act of Congress two hundred thousand dollars of that trust-fund was devoted to the building of the houses and for beneficial purposes.

A. What do you mean by beneficial purposes?—A. The erection of the industrial boarding-school house was one of them.

Q. How much did that cost, do you know?—A. I cannot state definitely, from memory. The main part of it was built by Agent White, and a rear addition was afterwards made to it by Agent Bradley. I think that the house cost somewhere about fifteen thousand dollars; it may have been a little less than that; I will not pretend to give definite figures.

Q. But, in point of fact, what I want to get at is this: Did you not know as superintendent at that time, that in the construction of this school-house by contract, and in the construction of the number of houses, which I understand to be over a hundred—you say not so many—the principal of the trust-fund of the Indians to the extent of two hundred thousand dollars was spent?—A. One hundred thousand dollars.

Q. Was it not more than that?—A. I understand that it was one hundred thousand dollars.

Q. Well, what disposition was made with the other hundred thousand dollars?—A. There has been no portion of the principal of their trust-fund expended, to my knowledge, since my connection with that tribe, excepting that hundred thousand dollars.

Q. What is the amount of their interest now?—A. I cannot state definitely.

Q. This trust-fund bears interest at the rate of five per cent. per annum, does it not?—A. I believe that it does.

Q. Well, if their annuity now amounts to $40,000—and your son, Agent White, stated that as a fact—that accounts for the principal of $800,000 at 5 per cent., does it not?—A. I cannot give you the figures definitely, but I can tell you where the deficiency is. The deficiency is a reservation of a proportion of the interest of the trust-fund by order of the officers at Washington, the Secretary of the Interior and the Commissioner of Indian Affairs, or some other authority. It is reserved under an old law, for the purchase of a reservation and the removal to the reservation of the wandering tribes of Winnebagoes in

Wisconsin. That portion of the interest of the Winnebago trust-fund is annually set aside and reserved for that purpose. While I was in office these wandering Winnebagoes of Wisconsin had a reservation purchased for them under orders of the Secretary of the Interior, by myself, from the Omahas. This reservation was about twenty miles square.

Q. That is immediately contiguous to the Winnebagoes, is it?—A. Yes, sir. Under a contract made by somebody in authority, not by the superintendent, these Indians were removed from Wisconsin, and placed upon that reservation. They did not like the restrictions of reservation life, and they gradually melted away and a special agent was appointed by the Commissioner to take charge of them alone. He devoted his entire energies to keeping them on the reservation, but they gradually melted away, until, from the 850 who removed there, there are not now probably more than 100 remaining in Nebraska. They have returned to Wisconsin. The object of the law setting aside that trust-fund interest, as expressed, was to purchase a reservation for these Indians and to remove them on it; and although that has been done and the reservation is there, and the Indians have moved away, there is still a portion of that trust-fund interest set aside annually; but these Winnebagoes of Nebraska have no control of this trust-fund interest; it does not come into the hands of the agents.

Q. I understand so, but you are not now answering my question. I am not speaking of interest, nor how it is paid, nor how divided between the Wisconsin Winnebagoes and the Nebraska Winnebagoes, but I am speaking of the amount of the principal expended in the construction of these houses. It is true—and I understand that—a portion of their fund was taken to construct these houses and to induce the Wisconsin Winnebagoes to come down and occupy their reservation. By the by, what was paid for that reservation purchased from the Omahas?—A. Two dollars and a half per acre.

Q. How many acres?—A. I think about twenty square miles.

Q. That was 12,800 acres; which, at two dollars and a half per acre, would amount to $32,000.

Q. Was that paid for out of the principal of the fund of the Winnebagoes?—A. I understand that it was.

Q. And these houses were paid for out of the principal?—A. They were.

Q. And they were built for the purpose of inducing the Wisconsin Winnebagoes to come down and live in them?—A. The houses of the Winnebago Indians I do not understand were paid for out of the principal.

Q. You do not so understand? Do you understand that the Wisconsin Winnebagoes have received their proportion of the $40,000 interest due the tribe annuallly?—A. I do not understand that they have received it; I understand that it is reserved for their use, for purposes specified by actual law.

Q. But not actually paid?—A. I cannot tell about that; I have no means of ascertaining.

Q. How many Indians are there in the Winnebago Agency in Nebraska?—A. About 1,400; the number varies at each census.

Q. Are the houses occupied by these Indians?—A. They are not. Some of those built for the Wisconsin Winnebagoes are now occupied, but a great many are vacant.

Q. Do I understand you that a great many are now vacant?—A. Well,

there are quite a number—those particularly, I think, near the line of the road.

Q. You say there are 1,400 of the Winnebagoes there now?—A. There are generally about that number.

Q. Do you know what proportion of the annually-accruing interest of $40,000 is set apart for the Wisconsin Winnebagoes?—A. I cannot state the sum from memory.

Q. Do you know what amount of the $40,000 interest on their principal fund is absolutely paid to the Nebraska Indians?—A. I cannot state it from memory.

Q. Do you know what proportion the Nebraska Winnebagoes get of this $40,000 annually due the tribe as interest on their fund? Of course, they get the larger proportion, do they not, since, according to your statement, the Wisconsin Winnebagoes had dwindled down from between 700 and 800 to 150 or 200?—A. About 100 Wisconsin Winnebagoes remaining.

Q. Well, the Nebraskas get the larger proportion of this annuity, do they not?—A. My impression is that the estimate upon which the interest was divided was allowing that there were 1,000 Winnebago Indians in Wisconsin. I think that was the data upon which the division was made.

Q. Then the division was made between the 1,000 Wisconsin Winnebagoes and the 1,400 in Nebraska, and the Nebraska Indians got the larger proportion because they had the larger number—almost one-half larger?—A. Yes, sir.

Q. About three-fifths?—A. Yes, sir.

Q. What proportion of this money is paid to them in cash per capita; any?—A. There is a cash annuity paid to them.

Q. How much per capita?—A. I would rather not attempt to state the sum, but my impression is about four dollars per capita last year; but I may be mistaken.

Q. When was it last paid?—A. It is generally paid about September or October.

Q. Was it paid at that period last year?—A. I should prefer not to state the period of time; my impression is that it was.

Q. At all events, was it paid last year?—A. It was. But I may err. It was not paid while I was at the agency.

Q. Well, was this appropriation of the $200,000 of the principal of the Winnebagoes, for the construction of buildings and beneficial purposes, made by the recommendation of the agent or by you as supervisory?—A. The origin of the appropriation of $100,000 was by the petition of the chiefs in council. It was approved by the agent and approved by the superintendent.

Q. And you were the superintendent?—A. I was the superintendent at the time.

Q. And it was also approved by the Commissioner and made the law by act of Congress?—A. Yes, sir.

Q. You think that the cost of construction of these houses was about $660 each?—A. Speaking in general terms, somewhere about that.

ANNUITIES—HOW PAID.

Q. How is this annuity to the Winnebago Indians now paid?—A. It is paid in cash.

Q. In cash?—A. Whenever it is paid, it is paid in cash.

Q. They furnish no provision, no clothing, nothing at all?—A. Yes; they have an annuity in goods and utensils and implements for farming.

That they estimate for. During one year I think they omitted it, but they generally estimate for the goods that are sent to them.

Q. What proportion of the interest on the fund is spent in the purchase of goods?—A. It varies each year; I could not state what it has been lately.

Q. Can you approximate?—A. I am under the impression that it was about $10,000 eight or ten years ago. I think they have now reduced it down to one-half of that.

Q. To $5,000?—A. About that.

Q. The balance of the money is then paid in cash, is it?—A. No.

Q. How then? I understood you that it was.—A. No; not the balance of their money.

Q. Well, that is the point I want to get at.—A. A portion of their money is paid to them in cash, which portion is fixed by the Commissioner. Any sum, per capita, that he recommends is paid to them. I think it has been about four or five dollars lately; somewhere about that.

Q. What proportion the Commissioner recommends is paid to them in cash per capita, and the balance is expended, how? I want to get at the point as to how the balance of this large interest upon the trust-fund is disposed of.—A. The expenditures at the agency are now particularly limited to the payment of labor, the payment for agricultural implements, and some for the payment of stock. I think these are the principal items of expenditure.

Q. Now?—A. Now.

Q. When you say expenses of employés, you mean the farmer, blacksmith, engineer, miller, &c., do you not?—A. I mean all the employés, except the agent and interpreter. Their salaries are paid out of another fund, not the tribal funds. All the others are out of tribal funds.

Q. Well, now, of the $5,000 paid in cash, what are the aggregate expenses of the employés of the agency, leaving out the agent and interpreter?—A. There is the miller and the engineer——

Q. What I want to get at is the aggregate expense.—A. The blacksmith, the carpenter, two shoemakers, and farmer. These are nearly all, I think, of the employés.

Q. Well, what do they get in the aggregate?—A. I cannot recall what they get accurately.

Q. Do you remember the salaries of any of them?—A. I could not state from memory.

Mr. HOOKER. Now, in that connection, I have a statement of the amount of salaries paid, which I will file in connection with this evidence.

Q. Now I want to know, Mr. White, what is done with the balance of the money due the Winnebagoes from the government on the trust fund after you have distributed the $5,000 for cash annuities which you say is paid to them, and when you have deducted the amount of wages paid to the employés; I want to know how they get the benefit of the balance—how it is paid to them?—A. It is impossible for me to state. It is all made a matter of record in the office.

Q. As superintendent, did you not have a knowledge of these facts?—A. It was not my duty to settle with the Treasurer for the amounts due these tribes at the end of each year.

Q. Well, if they are about 1,400 in number, as you say they are, and if they receive from the Government of the United States, yearly, their proportion of the $40,000, which is due them, and if they pay no taxes upon land, and no personal taxes, ought they not to be one of the wealthiest communities of that number in the country? They ought to

have ample funds, in connection with their agricultural returns, to make them a wealthy community?—A. Yes, sir; certainly.

Q. You are confident, now, that they are paid a portion of their annuity in cash annually?—A. They were last year.

Q. Do you think that if an agent should be sent from the Army to take charge of the post at the Winnebago and Omaha Agency (I believe they have been consolidated, have they not?—A. Yes, sir)—if they should retain their farmer, blacksmith, miller, &c., most of whom I was glad to find were Indians, and he should allow the school to go on as it now does, do you think that they would be retarded in their progress?—A. I have no opinion in regard to that.

By Mr. BOONE:

Q. Who has been agent for the Winnebagoes for the last few years?—A. Howard White.

Q. A relative of yours?—A. My son.

Q. I did not understand your statement fully in reference to the $100,000 appropriated to building their houses?—A. I did not say it was appropriated to build houses.

Q. For what purpose?—A. For beneficial purposes.

Q. Well, I want to get at the fact how it has been expended, if I can.—A. I have no data on that.

Q. Well, we will take the data you have furnished in your statement, and see if we can find anything from that. Did I not understand you to say that 90 houses were built for the Winnebagoes? Is that correct, according to your recollection, Mr. White?—A. I would rather not be confined to a statement of these figures.

Q. Well, you have made a statement here in writing, and you file it as a part of your evidence, and I want to know if that is accurate or not.—A. What I stated in writing is not in reference to the houses that were built under that appropriation. I did not attempt to state anything of that kind. That is a statement of the number of Indian houses that were there.

Q. Very well, so I understand; but I understood you to state that there had been about 50 of these houses of one character built?—A. Fifty frame dwelling-houses out of the hundred.

Q. And 25 of brick and frame altogether?—A. Yes.

Q. And about 15 of brick exclusively, which would make 90 houses, or about that?—A. Yes, about 90.

Q. Now, you say that your recollection is that the average cost of these houses was $660 each?—A. About $660, from my recollection; I do not wish to be understood as stating that definitely.

Q. Well, I understand you to state it approximately at $660 a house?—A. Yes, sir.

Q. And then there was expended about $15,000 for that boarding school?—A. Yes, sir; I think it cost about that.

Q. That makes $74,400. Now, for what other purpose was the $26,000 left of the $100,000 to be expended?—A. I cannot definitely state.

Q. Can you state anything further, definitely, in relation to this?—A. A large amount was spent for breaking lands, for agricultural implements, and a large amount for wagons, horses, harness, &c.

Q. Well, let me make an inquiry, just here: Was the money for farming implements, breaking lands, and for wagons, horses, &c., paid out of the appropriation of $100,000 of the principal, or was that paid out of the interest accruing from the trust funds?—A. In both ways; a large amount was paid for out of that $100,000.

Q. Now, you were superintendent at that time, and I understand that you let most of the contracts, or a number of them?—A. I approved them.

Q. Very well; approved them. Is there any record to show exactly what was done with that $100,000?—A. Yes, sir; the agent can show the record of every dollar of it.

Q. You approved all the bills, I suppose?—A. The bills passed under my vision; the copies of these accounts were filed at the end of every three months, in my office.

Q. They were obliged to be approved by you?—A. Yes; and these records are in the Indian Office.

Q. And show exactly what has been done with the whole of that $100,000?—A. Yes, sir; you will find accounts for it all.

Q. Now, if it is true that there is another $100,000 of the principal of that fund that has been used, have you any knowledge of what it was used for?—A. I have no knowledge of another $100,000 used at all. I know nothing about this $200,000.

Q. You do not understand that there was $200,000 used?—A. That there was not $200,000.

Mr. HOOKER. I want to call the attention of the committee to a communication received from General Marcy, in which he desires to correct in some important points a letter which he addressed to the committee before I arrived in Washington, and about which I find a letter here. It was a letter addressed by him at your request, Mr. Chairman, to the Secretary of War, and sent to the committee by General Marcy. He says that he committed some errors as to date and an error in referring in this letter to a certain report as having been made by one set of officers, when, in point of fact, it was made by another. I will read what he says to me:

> Will you do me the favor to have these errors corrected in my letter referred to, as follows:
>
> In my quotations from the Annual Report of the Commissioner of Indian Affairs, and also from the report of the commissioner sent out to negotiate with the Sioux for the relinquishment of the Black Hills country, please insert 1875 for 1876; and in place of the following words, "The Commissioner, in the report referred to, says," write this: "The Commissioner, in the report referred to, quotes the following from the report of the Indian Peace Commissioner, dated January 7, 1868."

[The corrections were ordered made as above.]

Mr. HOOKER. I have also a paper containing a simple statement of the number of agency employés, the amounts which are paid, &c., which I will also furnish, and ask that it be published in connection with the testimony which has been taken.

You will also remember, Mr. Chairman, that while at Omaha we took the testimony of Lieutenant Lee in reference to the conduct of matters while detailed from the Army as agent of the Spotted Tail Indians. I have sent to the War Department since my arrival in Washington and requested them to furnish me with the report of his predecessor, Lieut. M. C. Foot. I will file this document, together with the indorsements on it, for publication in connection with this testimony.

These documents were received and ordered to be filed with the testimony.

On motion, Mr. Boone submitted for publication extracts from the report of General Macfeely, Commissary-General of Subsistence, bearing upon the value of stores and cost of transportation during the fiscal year.

The report was addressed to the Committee of the House on Indian Affairs, and to save time Mr. Boone asked that the portions he had marked

be made part of the records of the commission. With the understanding that General Macfeely would be called upon to testify before the committee, Mr. Boone withdrew his motion.

Mr. Hooker, by leave of the committee, submitted the following letters, which were ordered to be published in connection with the testimony:

LETTER FROM LIEUTENANT FOOT.

SPOTTED TAIL AGENCY, NEBR.,
September 15, 1876.

SIR: I have the honor to inform you that I have completed the count of Indians at this agency, and find a total of 4,614 including the half-breeds and Indian families of about twenty-eight whites, who are drawing rations under the treaty of 1868.

I am confident this count is perfectly correct, as I made it myself with the assistance of the interpreter and a clerk, both of whom know the Indians here.

From all information I can obtain but 4 lodges of these Indians have gone north to join the hostile force.

They will average about 7 persons to a lodge. I include in my count 148 Indians who have been transferred from Red Cloud Agency in the last month.

Mr. E. A. Howard, the late agent here, transferred to me on his list 9,135 Indians. I am informed by one of my employés who was superintendent at the Brulé Agency when it was on the Missouri River in 1869–'70, that the total number of Indians in this band at that time did not exceed 4,500.

Very respectfully, your obedient servant,

M. C. FOOT,
First Lieut., Ninth Infantry, Acting Agent.

The ASSISTANT ADJUTANT-GENERAL,
District of the Black Hills.

[First indorsement.]

HEADQUARTERS DISTRICT OF THE BLACK HILLS,
Camp Robinson, Nebr., September 17, 1876.

Respectfully forwarded to the assistant adjutant-general, Department of the Platte, and attention invited to the very great discrepancy between the number of Indians turned over (on paper) as drawing rations, by the late agent, to Lieutenant Foot, Ninth Infantry, acting agent, and the number derived from the recent count, which, I feel satisfied, is as accurate as it could well be, and that but very few left the agency between said transfer and date of count.

R. S. MACKENZIE,
Colonel Fourth Cavalry, Commanding.

HEADQUARTERS DEPARTMENT OF THE PLATTE,
Omaha, Nebr., September 23, 1876.

Official copy respectfully forwarded to headquarters Military Division of the Missouri, for the information of the Lieutenant-General commanding.

In absence of Brigadier-General Crook,

R. WILLIAMS,
Assistant Adjutant-General.

Official:
R. C. DRUM,
Assistant Adjutant-General.

WESTERN UNION TELEGRAPH COMPANY,
Chicago, Ill., September 2, 1876.

To General W. T. SHERMAN,
Washington, D. C.:

Colonel Mackenzie has made a careful count of the Indians at Red Cloud Agency and finds the number to be 4,760 all told. This, I think, is at least 3,000 less than the number alleged to have been there before the count and who were fed.

P. H. SHERIDAN,
Lieutenant-General.

WASHINGTON, D. C., *December* 11, 1878.

WILLIAM STICKNEY sworn and examined.

By the CHAIRMAN:

Question. What is your name?—Answer. William Stickney.

Q. Where do you reside?—A. In Washington City.

Q. Have you had any acquaintance in the past with Indian affairs?—A. I am at present a member of the Board of Indian Peace Commissioners.

Q. You are at present a member of that board?—A. Yes, sir; secretary of the board, and chairman of its executive committee.

Q. How long have you been a member of the board?—A. I think I was designated upon that board in 1874.

Q. Have you, during that time, come in contact with the Indians—that is, have you visited them anywhere in their country?—A. I have, to some extent, sir.

SPECIAL COMMISSIONER TO VISIT JOSEPH'S BAND OF NEZ PERCÉS.

Q. What Indians did you visit?—A. I was designated to accompany a special commission to the Nez Percés—Joseph's band—at Idaho, two years ago.

Q. Was that before or after they were sent down to the Indian Territory?—A. That was before the Nez Percés war. I was with that commission during all its sessions and visiting in that country. I have visited the Pottawatomies, and I have visited some parts of the Indian Territory, and have seen their Indian work there, somewhat. That is about the extent of my personal observation.

Q. At the time you visited the Nez Percés they were all in a friendly attitude toward the government—there were no troubles between them and the whites, were there?—A. The object of our commission was to induce Joseph and his band to come on to the reservation. They were wandering off, and trouble was apprehended by the settlers, and this commission was appointed to try and induce them to go on to the reservation.

Q. Did you and your commission see Joseph?—A. O, yes, sir; we had several days' session with him, at the agency at Lapwai.

Q. He was not satisfied to go on to the reservation, was he?—A. No, sir; we were hardly able to persuade him to go on to the reservation. He was very much inclined himself—as most of us thought—to comply with our request; and I think, if he had not been influenced by his "dreamer," his Smohola, as he is called, who was constantly whispering to him, and trying to make him discontented, he would have come on to the reservation. The last words we had with him, after the council was over, were had one day in the church. We had had a very interesting session there, and I took Joseph by the hand, after we had adjourned, and told him that he ought to ponder well what we had told him, that he would certainly find it to his interest to comply with our desires. And I think there were tears in his eyes. I think he was a good deal affected; and as he pressed my hand, on parting, he said to me, "Mr. Stickney, I do not feel that we ought to subject ourselves to the government. We do not acknowledge that the government has any rightful power or control over us. The eagle flies over the plains, the deer roams through the forest, the sun shines for all, the waters run for all, and we are entitled to receive these benefits as well as the white man." That was his philosophy. His religion I do not know, but I am informed

it is based upon an old superstition which he has from this wizard Smohola, who is a great pest and nuisance to the whole tribe.

Q. How long ago was that?—A. It was in the fall of 1876 or 1877. The outbreak occurred the next summer.

Q. He did not then positively promise that he would go on the reservation?—A. No, sir; he did not.

Q. What reserve were you trying to get him on; the Dakota?—A. No, sir; upon a reserve in Idaho; a small reserve of their own.

Q. They never did go on?—A. No; his band never did. The other Nez Percés went on and were doing very well—were contented and becoming quite prosperous; but Joseph's is a roaming nature; he is of a wild, nomadic disposition, and is very restless under constraint of any kind.

Q. Did he express any willingness at that time to adopt the customs of civilized people, in the way of farming, or anything of that kind?—A. No, sir. On the contrary, he was utterly averse to anything that looked like civilization. I do not believe that Joseph would receive a gratuity from the government, a present, or a bounty of any kind; and sooner than put on a coat he would cut off his right arm. He would look upon it as degrading to himself to be the recipient of any bounty from, or to acknowledge his dependence upon, the government in any form. He has very lofty ideas about that.

THE TRANSFER SHOULD NOT BE MADE.

Q. Now, sir, after all this, what would you think of the propriety of changing the management of Indian affairs and turning it over to the military department of the government? Would that be a change for the better, in any respect, do you think?—A. Mr. Chairman, I have very strong convictions on that subject; and I have had them for a good while—ever since the report made by the Joint Committee of the Senate and House of Representatives in 1875 or 1876, I think, where, if I remember correctly, this same subject was considered, among others, and upon which the committee made a unanimous report to the Senate—Senator Doolittle being chairman—to the effect that the Indian Bureau had better stay where it was. Ever since then I have been strongly of that conviction.

By Mr. SCALES:

Q. Did you mean 1876?—A. No, 1866; I beg your pardon, it was in 1865, 1866, or 1867—I think perhaps it was in 1865. Ever since then, with what reading I have had on the question, and the observations I have made, and the intercourse I have had with others—and among these I may mention my father-in-law, Mr. Amos Kendall, who was very closely connected with the Cherokee Indians—I have been of that conviction. I may say that during the early part of my married life I was a member of his family, and had a great deal of intercourse with these Indians; and, of course, was at that time intimately acquainted with their character and condition; and I am satisfied in my own mind, with due deference and respect to the opinions of others, that such a change would lead to the extermination of the Indians; at least, if the present counsels and sentiments of the chief officers of our Army obtain, and are acted upon as they have been in the past. I think I remember some such language as this, used by General Sherman in speaking of the Sioux: "They must be pursued with earliest vindictiveness, even to extermination of the men, women, and children." And I think I remember language used by General Sheridan something like this: "They

must be punished; they must be dealt a hard blow; they must be wiped out." It seems to me that with such sentiments in the minds of our commanding generals, and with the record that we have of the past, we may look for a not very remote "extermination" and "wiping out," as General Sheridan expresses it, of the remnant of Indians that are among us.

THE INDIANS SHOULD BE EDUCATED.

I myself have always entertained a more humane view of the subject. I think that this country cannot afford to adopt any policy that will lead to the extermination of the remnant of Indians who are at present occupying our lands. I look upon the matter in an altogether different light. I think that the government ought to pursue a generous policy toward them. I think that it ought to make a very much larger appropriation for their education; and that, to my mind, is the present duty of the government toward the Indians.

I do not have much faith in bringing the old Indian men and women to adopt the civilian's mode of life, and conform to all the white man's customs and manners; but I do believe that, commencing with the rising generation by educating them in industrial pursuits and giving them an elementary education, we can, in a generation or two, solve the problem—make the Indian self-supporting, and contribute to the development of the resources of our own country.

INDIANS CAN BE MADE SELF-SUPPORTING.

Q. You think, then, that they can be made self-supporting, if properly managed?—A. I have no doubt of it, myself. I have seen the Modocs, for instance, although they are a very small band and have been on the reservation but a short period, I have seen their work, and been surprised at their rapid improvement. I know Captain Pratt very intimately, who brought up those Florida Indians to Hampton, Va., who has told me a great deal about his success in educating and teaching those children. I myself have seen the Indian children on the reserves in the Territory go up to the blackboard and solve problems most satisfactorily. I have seen them at Niobrara, where I paid a visit to Mr. Huntingdon's school, and have attended their examination, and listened to their answers for nearly a whole day on questions in arithmetic and other studies, and they showed a most excellent proficiency in them all. They were bright and quick to answer most of the questions I put to them. And the same is true of the Pottawatomies. I went to a school there, put problems upon the blackboard, and they would give me the answers very nearly, if not quite, as readily as boys of the same age would have done in our common public schools. I do not know that I could see any difference between the two. I have therefore no question whatever that the Indian youth are capable of being taught, and of becoming in due time self-supporting and civilized.

General ROBERT MACFEELY sworn and examined.

By the CHAIRMAN:

Question. Will you please state your name?—Answer. Robert Macfeely.

Q. What is your position, General Macfeely?—A. I am Commissary-General of Subsistence of the United States Army.

Q. How long have you been in that position?—A. I have been in that position since May, 1875.

Q. It is your business, then, to direct the transporting of supplies to

the Indians as well as to the Army, is it; or have you anything to do with that department?—A. It is my business to furnish subsistence supplies to the Army, to disburse the appropriations made by Congress under the direction of the Secretary of War.

Q. Confining yourself to the War Department particularly?—A. Yes, sir, to the War Department.

Q. We are taking testimony, general, on the subject of the transfer of the management of Indian affairs, and the proposition is to turn it over from the civil to the military department; have you ever given any thought to the matter?—A. No, sir; I have never given a great deal of thought to the matter; I have seen it discussed in the newspapers.

Q. You are not then prepared to say whether it would be better for the Indians or for the government to make the transfer?—A. I am prepared to give my opinion for what it is worth.

Q. Very well, we will be glad to have it.

THE INDIANS WOULD DO AS WELL UNDER THE MILITARY AS THE CIVIL MANAGEMENT.

The WITNESS. In my opinion, it would be as well for the Indians, and as much for the benefit of the government, to have the proposed transfer made as to have the matter remain as it is under the present administration.

Q. It would be as well?—A. Yes, sir; I do not believe it would be any advantage to the Army, however, and therefore I do not desire to see the transfer made.

Q. What view are you taking of it, general, in this expression of your opinion? Do you look at it in its economical aspects—financially, or as a question of civilization, and morally?—A. I take both a financial and a moral view of it—looking to the interests of the government and of the Indians. I think that if the officers of the Army were intrusted with the purchase and distribution of stores, their administration would compare equally with that of the Interior Department, by which the matter is now managed. I claim nothing more. But in point of ability, business ability, education, and morals, the elements that go to make up capacity and character, I believe that the Army administration of this business would not suffer in comparison with that of the present administration.

Q. Do you think that the War Department is able to furnish supplies cheaper than the Interior Department can furnish them? Do you think that, as a rule, they do so furnish them?—A. I do not claim that we can furnish the same quality and quantity of supplies any cheaper at all. I believe we can do it as cheaply; but I do not know any reason why we should be able to do it cheaper, unless it be the one exception that I have named in my annual report, and that is that the supplies furnished for the Army are paid for at the time of delivery, generally, while under the Interior Department, as I understand it, the supplies are not paid for until some time after they are purchased, the accounts having to be sent to Washington and audited, and pass the Commissioners, which takes time—in one case I have heard of, two or three months; and of course persons who are selling stores expect to be paid for the time that they are out of their money.

Q. You think, then, that if the same prompt payment were made by the Interior Department as in the War Department in the purchase of supplies, they would both have equal advantages in purchasing?—A. Yes, sir.

Q. You said both financially and morally; in what particular do you

think it would be better for the Army to control this matter than the civil department?—A. I have not stated that it would be better administered by the Army; I said it would be as well administered. And I said morally, because I have seen that the administration of the Army has been censured, and it has been charged in the public prints with paying more for supplies than the Indian Department. I contend that we do not pay any more. I am prepared to show to the committee that we do and can purchase the same quality of stores as cheaply, and have always done so, as any other department of the government.

Q. You think that when any other department claims to buy supplies cheaper than the Army, it is because the quality is different in the two cases?—A. I have merely known of these things through the public prints; I know nothing officially of them. I have seen statements of that kind. For instance, I saw it stated a day or two since, that it was given in evidence before this committee that if the Army had to supply the beef to the Indian Department it would cost some $600,000 more than it now does. I do not believe it would, sir.

ARMY OFFICERS SHOULD NOT HAVE POWER TO MAKE WAR.

Q. What is your opinion, then? you do not state any preference. What do you think of the proposition that the military near the agencies should have the authority to punish the Indians; and, if necessary, resort to arms without applying to the civil authorities? Would you be in favor of that?—A. No, sir; I think that the Army in these matters should be under the orders of superior officers—the President of the United States; and that no officer of the Army should have any authority to make war against the Indians or against anybody else, without the Executive authority. I would not leave it in the hands of any individual.

DISCREPANCIES IN SUPPLIES.

By Mr. BOONE:

Q. As you state, General Macfeely, it has been said, and in some instances it has been pointed out, that you have paid more for beef and flour and Army stores than it costs the Interior Department. Now take the article of beef first. How do you account for the discrepancy, if there is any discrepancy, in the price you pay over that paid by the Interior Department?—A. By the Indian Department's furnishing in larger quantities, and furnishing beef on the hoof. They order several thousand head of beef—the deliveries being often from one thousand to two and three thousand head at a time. Then, the Army is distributed in one hundred and fifty or one hundred and sixty different posts, and the garrisons vary from thirteen to a thousand men, Our contracts for fresh beef are generally made for beef from the block—that is, net beef, of good, marketable quality, to be delivered in such quantities and at such times as the commanding officers of the posts may require—not exceeding three or four times a week—generally on alternate days. Then the Army contractors for beef are obliged to keep cattle on the hoof; to herd and subsist them; to kill them; to keep men to make the issues at their own expense; and we pay for beef net, while the Indian Department receive beef on the hoof, slaughter them themselves, and distribute them to the Indians as they require.

Q. In that connection, is it not the case that sometimes there is a very small detachment of troops at a post that needs supplies?—A. Yes, sir; and it would not require, during a week, more than two, or three, or four hundred pounds of beef.

Q. You do require, by an Army regulation, beef of a certain quality and weight, do you not?—A. Yes, sir.

Q. Now, suppose you were to require three or four hundred pounds of beef at a post during a week, and it was found that only two or three hundred pounds were needed when it reached the post, who sustains the loss of the part that is not consumed?—A. The contractor. I will mention in this connection, also, that contracts are not for specific amounts; that the number of a garrison is not a fixed number; its strength is changeable. There may, for instance, at the time a contract is made, be two hundred men at a post, and within a week or a month afterward they may all be sent off into the field with the exception of ten, twenty, or fifty men, and they may be absent for six months; the contractor is obliged to furnish those that remain, if there should be but one soldier, at the same price that he would have furnished the whole two hundred if they had remained there.

QUALITY OF BEEF SUPPLIED BY THE ARMY.

Q. Now, what is the quality of the beef that the Army requires to be furnished to it by contract?—A. The quality is stated in the advertisements generally to be beef weighing upon the hoof an average of about one thousand pounds net; to be in good condition; that no beef will be accepted that weighs less than eight hundred pounds.

Q. Well, is there any discrimination made against certain classes of cattle?—A. Yes, sir; there is a discrimination made against stags, and all unmarketable beef; it must all be in good condition. Not only that, but the amount is subject to inspection after it is killed, and if, in the opinion of the commanding officer or officers to whom it is issued, it is not of the proper quality or quantity, the commanding officer can order a board of survey, and if they are of that opinion, they throw it upon the contractor's hands; and if the contractor refuses to furnish the proper article the officers are at liberty, under the contract, to purchase it at whatever price they can get it and charge the difference to the contractor.

Q. Now, if you in your department were authorized, and it should become necessary and proper that you should buy herds of cattle as they do in the Interior Department for the Indians, is there any reason why you could not buy beef as cheaply as the Interior Department?—A. There is no reason in the world that I know of, and if there is any reason I should like to know what it is. There may be some reasons given which will not stand the test of our requirements. I think I could controvert any reason that can be fairly put forward. I believe that the administration of the Army, its system of accountability, the knowledge of the officers whose business it is to make the purchases, and every other necessary element in the question are adequate in all respects to the proper and faithful discharge of all the duties belonging to that administration.

Q. You have then a system of inspection of the beef and other supplies?—A. Yes, sir; and, in addition, it may be said that every soldier in the Army becomes virtually an inspector of supplies, as well as every officer, for if they get anything that is not good quality we very soon hear of it; and they are not only not required, but are not permitted to eat or use poor supplies, if others can be obtained.

ARMY SYSTEM OF INSPECTION.

Q. General, will you please give to the commission an account of your system of inspecting supplies generally? For instance, you receive bids

for the supply of the Army with sugar, coffee, flour, and the like; what course do you pursue in the matter?—A. The course pursued is laid down by law, you know, which specifies the kind and quality of stores required, the kind of packages in which they are to be put up, &c. It requires that all purchases, when the time will admit, shall be made upon published advertisements duly inserted in the leading papers in the market of supply; that written bids or proposals shall be received; a day and hour of opening these proposals is fixed, and at the time stated for the opening of the proposals they are opened in the presence of the bidders, or anybody else who desires to be present.

Q. Well, at that point, now, is there a board of inspectors present at the opening of the bids?—A. No, sir; there is not. The standards of the articles bid for are distributed to the officers whose duty it is to purchase, and they are instructed to furnish nothing inferior to the standard of articles delivered to them. It is their duty to accept the lowest bid for the proper articles, such as sugar, coffee, flour, beans, rice, &c., and they always take the lowest bid, I believe. After these goods have been accepted, before they are delivered, they are inspected by the officer himself, or by a competent inspector under his orders, to see that the quality of the articles bid comes up in all respects to the standard—to the sample—and that the packages are of the proper kind and strength, and marked as required.

BIDS SOMETIMES REJECTED.

Q. If they do not come up to the samples as furnished they are rejected, are they?—A. They are rejected; yes, sir.

Q. Now, it has been stated that it is usual for inspectors and receiving officers of the Army, when bids were offered, to accept the lowest bid, irrespective, to some extent, of the fact whether the articles come up to the sample or not; in other words, that they were governed by the bids, not by the articles. Is this true?—A. I will state positively that it is not usual to do so, and I would like to know a single exception in my department to this rule; if there is one I do not know of it; if there is a single exception to this rule I should insist upon knowing of it, and I would correct the irregularity very soon.

Q. Do you ever reject bids?—A. Yes, sir.

Q. All the bids, for instance?—A. Yes, sir; we reject all bids, if in the opinion of the officer the articles bid for are not of the proper quality, and if the price is above the market price. He is authorized to reject all bids; and in most of the advertisements it is stated specifically that the officer of the department reserves the right to reject any or all bids for cause.

Q. In advertising for purchases for the Army, you require the very best articles, do you not?—A. Yes, sir, we require the very best good articles, for the reason that the transportation of these articles is a very large item, and it does not pay to purchase and transport an inferior article, for it is more liable to deterioration, and does not give satisfaction, and the consequence would be a loss to the government in almost all such purchases.

Q. You make it a point, therefore, to get the best possible good articles you can obtain for the use of the Army?— A. Yes, sir.

COMPARATIVE COST OF TRANSPORTATION UNDER THE TWO SYSTEMS.

Q. General, there has been some statement here in reference to the comparative cost of transportation in the Interior and the War Departments, and we want to get at the facts. I believe it has gone upon the

records in some shape or other that your transportation for the War Department exceeds that of the Interior Department by some $4,000,000 a year; what number of persons did the War Department transport last year?—A. I have a copy of the report of the Secretary of War, which will answer that question.

Q. I wish you would refer to it here, and make it a part of your evidence, because you are cognizant of the facts, I believe?—A. I will do so, sir. I will state that this transportation business belongs to General Meigs particularly, and he, as Quartermaster-General, is more familiar with it: but I will quote from the report of the Secretary of War for the year 1878, page 10. The Quartermaster-General reports that during the fiscal year "The Quartermaster's Department moved 79,260 passengers, 11,400 beasts, and 109,261 tons of military material."

Q. Well, taking that statement as accurate, state whether the transportation of the mere supplies is or is not a very small item of the whole transportation account. It is a very small part, is it not?—A. Yes, sir.

Q. Comparatively, I mean.—A. Yes, sir; it is a very small part, comparatively, of the whole amount of transportation; and the commission will see that these 79,260 passengers includes the Army proper and the employés; and as the Army consisted of 25,000 men, they must have moved these men, some of them, several times.

Q. What you have stated about the quality of beef and the method of issuing it applies to all the other Army supplies, or commissary, does it?—A. Yes, sir.

Q. With reference to the quantity and quality and time of delivery, I mean. You have said, general, that in consequence of the times of delivery, and having to furnish small amounts, it necessarily makes the price higher; that remark applies to other articles besides beef, does it?—A. I think it does, sir; but not to such an extent as the beef; for the reason that we purchase supplies at the point nearest to consumption, where we can purchase articles the cheapest, taking into consideration the quality, cost of transportation, deterioration and waste of stores in the transit. In other words, if we were at a post out on the frontier, where we can purchase the products of the country—beef or flour, or things that are manufactured there—we can generally do it cheaper than we can by purchasing in a distant market; but when it comes to sugar, coffee, and articles that have to be imported, or that are manufactured at a distance, we purchase them generally in the large markets of the country, principally from wholesale merchants, or from the manufacturer, who generally bids for these supplies, from first hands.

Q. Are your inspecting officers generally men of experience in their line of business?—A. Yes, sir.

Q. State whether the Army is frequently called upon by the Interior Department to furnish inspectors of supplies?—A. Yes, sir; for the last three and a half years that I have been Commissary-General of Subsistence, of my own knowledge I know that we have had frequent requests for officers of the Army to inspect stores; and I think that in the form of contract laid down by the Commissioner of Indian Affairs he states that his stores shall be subject to inspection—that is, some of them—by Army officers.

Q. I believe that is all I wish to ask now, general.

By Mr. SCALES:

Q. I find in your recent report, general, reference to a letter addressed to the Secretary of War by the chairman of the Indian Committee of the House of Representatives, dated March 23, 1878, and your reply to the same, in reference to the comparative cost of the two systems of

furnishing provisions, under the Interior and the War Departments. Are you prepared to make that letter now a part of your evidence here?—A. Yes, sir. If the committee desire it I will submit the letter. It is a copy of a letter addressed by me to the honorable Secretary of War. [Reading.]

WAR DEPARTMENT,
OFFICE COMMISSARY-GENERAL OF SUBSISTENCE,
Washington, D. C., March 23, 1878.

SIR: Referring to the communication of the Hon. A. M. Scales, United States House of Representatives, chairman of Committee on Indian Affairs, dated March, 20, 1878, inviting your attention to the claim set up by the Indian Commissioners for 1877 (at page 5 of their annual report), namely, "that the purchase of flour and beef made by the Indian Department and delivered at some points is at less cost to the government than the same supplies purchased for the Army," and asking if the War Department "can furnish a reason for this difference," I have the honor to inform you that, from reports received at this office, it appears that the flour purchased by the Indian Department is not of the same grade as that purchased for the Army.

An officer (Capt. W. H. Nash, commissary of subsistence) who has been inspecting Indian stores and purchasing for both the Indian and Subsistence Departments, states in a telegram received at this office on the 21st instant, as follows:

"Flour offered to me for inspection on contract made by Indian Department has generally been inferior grade of 'double extra,' and that purchased for issue to troops has been best grade 'XXXX,' Colorado flour, best made.

"The flour inspected delivered on contract was equal to sample furnished by Indian Department. I consider the sample furnished as wholly unfit for issue to any one. Have had the best opportunity of judging of the comparative qualities; have inspected flour for Indian Department for nearly two years, and purchased for both departments."

With reference to the difference in cost of beef, I am of the opinion that it arises from two causes: One, that at posts but small quantities of beef are purchased by the Subsistence Department (the garrisons being small), and generally from the block as required for daily issue, while the Indian Department purchases in large quantities, and generally cattle upon the hoof; the other, that the beef-cattle generally purchased by the Indian Department are inferior to those purchased by the Subsistence Department.

The specifications for beef-cattle to be furnished the Indian Department under advertisement of March 30, 1877 (which it is presumed are the specifications of 1874–'75 and 1875–'76), required cattle "to be steers and cows not over seven years old, to average not less than 850 pounds at each delivery, no animal to weigh less than 700 pounds." By the contracts made by the Subsistence Department for beef-cattle at the posts nearest the Red Cloud and Spotted Tail Agencies in 1874–'75 and 1875–'76, the years referred to in the report of the commissioners, it was stipulated that the cattle furnished should be "steers from four to six years old, the herd averaging not less than 1,000 pounds gross, no cattle to be accepted weighing less that 800 pounds gross." These cattle were to be delivered when required by the commanding officer for expeditionary purposes or for temporary camps in the vicinity of the posts. The contractor might not be required to furnish any, and he might at short notice be required to furnish a considerable number, while the numbers contracted for by the Indian Department were large and specific.

From the above it will appear that a comparison of prices alone will not enable one to decide as to the cheaper prices and economy of management of the two departments in the purchase of flour and beef.

Very respectfully, your obedient servant,

R. MACFEELY,
Commissary-General of Subsistence.

The Hon. SECRETARY OF WAR.

By Mr. BOONE:

Q. If you have any other statement or documents bearing upon the question which you wish to make a part of your evidence, we would be pleased to receive them.—A. I have no desire to submit any statements or documents. I came here simply to answer questions and have nothing to state.

MANNER OF PURCHASING BEEF.

By Mr. STEWART:

Q. Do you get any beef weighing a thousand pounds net?—A. Or gross, I said.

Q. You were speaking of purchasing your beef net, and the Interior Department gross, and that that made a difference in the price?—A. I do not think I said—if I did, I did not intend to say—that we purchase cattle of a thousand pounds net. I alluded to their being required to weigh a thousand pounds gross, but we pay for them as net beef—after the beef was slaughtered and weighed, so much a pound net, and not gross.

Q. Do you get any beef that weighs more than a thousand pounds gross, except in Montana?—A. Yes, sir; we do—gross.

Q. Would the difference between the purchase in your department and in the Interior Department amount to an advantage on the part of the Interior Department ranging, say, from 50 to 85 per cent.?—A. I do not understand the question, exactly.

Q. You say you purchase the beef at net, and the Interior Department at gross, and the difference in the quality of the beef—you being restricted to a certain weight and to certain qualities—would make your beef cost a little higher?—A. I say that it does, and necessarily does, because when beef is delivered by net weight, and the contractor kills a steer that weighs a thousand pounds gross, after he has killed and dressed the quarters may weigh, say, five hundred pounds, if he is only called upon, as he may be liable, to deliver of that five hundred pounds two hundred pounds, and is liable to lose three hundred pounds more by reason of the effect of the climate before he is called upon again to furnish beef—we have to pay, probably, for that difference. And for that reason I do not mean to be understood as saying or believing that the Interior Department should issue to the Indians in large quantities beef net as we purchase it; but I say it is cheapest for the Army to let the contractor take the responsibility of that loss than it is for us to buy cattle on the hoof and herd them and take care of them and then probably sustain the same loss that he does, as it has been found by experience; and for that reason we purchase net.

Sometimes settlers or villagers in the neighborhood of a post or a contractor, may have a shop, and he may be able to sell the surplus beef to others, and on this account he may be able to furnish it cheaper than the government could purchase it for; but I merely made that statement to show why it costs more to the Army, not intending to say that the Indian Department should furnish the Indians in that way, because I do not believe they should. I believe they are furnished properly now; but I say that if we had to purchase beef of the same quality and in the same way, I do not know of any reason why we could not purchase as cheaply.

CLASSIFICATION OF FREIGHT.

Q. Well, now, in the matter of transportation, generally, how are your freights classified—by the railroad classification?—A. Yes, sir.

Q. That makes it rather to your disadvantage, does it not, over the method of making a contract with the roads and not using their classification of freights?—A. The subject of classification is one of which I have but a general knowledge. That whole subject is under the Quartermaster-General, who furnishes the transportation, you know.

CAPTAIN NASH'S INSPECTION.

Q. In this letter of yours to the Secretary of War, general, in regard to Captain Nash's inspection, I would like to ask what quantity of flour he inspected for the Indian Bureau?—A. Well, sir, I could not tell you now; I could get you the letters, which would be more satisfactory. I could not tax my memory with the amount. He has been on that duty.

Q. Well, was this dispatch of the 23d received on the 24th, as stated?—A. If it is stated in that letter that it was received then, it was so received.

Q. I should like to ask you, general, what brought this answer out—what the inquiry was that induced the reply of Captain Nash?—A. It was in reply to a telegram from me, I think; but if the commission desires it, I will be very glad to furnish them with the whole correspondence on the subject. But I know that he had inspected stores, and I saw the statement charging that it costs more to feed the Army than it costs for the Indian Bureau; and it was in response to a telegram from me to know about the quality and grade. But I would prefer it if the commission would permit me to submit the full correspondence on the subject, because that will explain it better than I can from memory now.

Mr. STEWART. I would be glad if that could be done.

Mr. SCALES. It is not voluminous, is it?—A. No, sir. It was in defending the administration of my department that I sent that, for the purpose of correction and explanation—to explain why it did cost more in the Army, and I admit it does cost more, but I wanted to show why, and I believe I have done it satisfactorily—at least to myself.

By Mr. STEWART:

Q. "Flour offered" means flour offered by contractors, does it not?—A. Yes, sir.

Q. He says, "Flour offered to me for inspection * * * has generally been inferior grade," &c. Then he probably "generally" rejected flour that was offered, except it was in accordance with samples?—A. I cannot state what he did, except from that letter, sir; I was not present, and know nothing more than what he states in this letter.

Q. He says, "Flour offered to me for inspection"?—A. I presume it was flour that had been offered by a contractor for his inspection before delivery to the Indian Department.

Q. He says: "The flour inspected, delivered on contract, was equal to the sample furnished by the Indian Department," and that he "considered the sample furnished as wholly unfit" for food; now what sample does he refer to, and who furnished that sample?—A. He says "equal," that it was "equal to the sample" he was inspecting for the Indian Department, and the flour that was submitted to him to be delivered under the same contract was equal to the sample that the Indian Department had furnished him.

Q. Do you know how much he inspected by that sample?—A. No, sir; I do not; but if the report is in my office I will hunt it up and send it to you.

Q. Do you know why Captain Nash did not make inquiries concerning it when he found that it was unfit for food?—A. No, sir; I do not.

Q. This was in 1876 that he inspected it, was it not?—A. I do not know, sir, whether he states that.

Q. Well, would not the inference from Captain Nash's telegram lead to the impression that all the flour he inspected for the Indian Bureau was "unfit for food"?—A. Yes, sir; I think that it is fairly subject to that interpretation.

Q. Is it not true that all the flour which has been received and inspected by Captain Nash has been "unfit for food"? You say that that was the information that, as you understand it, he intended to convey?—A. Yes, sir; he seems to speak of it as if all the flour offered for inspection on contract furnished to the Indian Department was generally of inferior quality.

Q. Well, is it not a fact that flour purchased for the Indian Bureau

must equal New York double X?—A. I do not know what requirement is specified in the advertisement as to the quality of the flour.

Q. Do you not know that New York double X compares with Colorado XXXX?—A. No, sir; I do not know that. We do not purchase flour by these marks or grades. We depend upon the market. In Saint Louis they grade flour in a certain way, and when we buy flour we advertise for a quality of flour to be equal to a certain sample, and the bidders are furnished with the samples of that flour; and when it is accepted it must be equal to that sample, without regard to mark or grade.

Q. The mark is not an indication?—A. No, sir.

Q. New York "double extra" may be equal to or superior to "Colorado XXXX"?—A. Certainly it may be, so far as I know. In Chicago flour is sold by samples altogether, without regard to the X's or grade in any market. In Saint Louis, at the Board of Trade, in Cincinnati, and I think in New York, they grade flour "extra," "double extra," &c., but it has a different meaning in different localities. For that reason, when we advertise for flour for the Army, which we do in almost every State of the Union, we do not designate any particular grade, but ask for a quality equal to the sample furnished.

Mr. STEWART. That is all, Mr. Chairman.

WASHINGTON, D. C., *December* 12, 1878.

The following letters were laid before the committee by the chairman, and were ordered to be published as explanatory of the testimony of the witnesses undersigned:

WAR DEPARTMENT,
OFFICE COMMISSARY-GENERAL OF SUBSISTENCE,
Washington, D. C., Dec. 11.

SIR: In response to the question asked me by the committee this morning during my examination, "Why Captain Nash sent to this office the telegram referred to in my communication of March 23, 1878, to the honorable Secretary of War, published in my annual report for the last fiscal year, page 13," I have the honor to state that the telegram was in response to the following telegram to him from this office:

"How does the flour purchased by the Subsistence Department for issue to troops compare in quality with that purchased by the Indian Department, and what opportunities have you had within the last two years of judging of the comparative qualities?"

The telegram from this office was sent to Captain Nash, to enable me to reply to the following, from Hon. A. M. Scales, chairman House Committee on Indian Affairs, dated March 25, 1878:

"I beg to call your attention to the claim set up by the Indian Commissioners for 1877, viz: 'that the purchases of flour and beef made by the Indian Department and deliverable at same points is at a less cost to the government than the same supplies purchased for the Army.' (See page 5 of said report, under head of 'Comparison of cost of supplies purchased by the War Department and by the Indian Office.') My object in making this inquiry is to ask if your department can furnish a reason for this difference, believing as I do that the purchases are made on as favorable terms by the Army as can be made by Indian Office, taking into account quality," &c.

Knowing that Captain Nash had had considerable experience in the inspection of flour for the Army and Indian Department, I sent him the dispatch I did. His reply by telegram was used in preparing the letter of March 23, 1878. His reply by mail was much more in detail; a copy is herewith transmitted.

Very respectfully, your obedient servant,

R. MACFEELY,
Commissary-General Subsistence.

Hon. ALVIN SAUNDERS,
United States Senate, Chairman of the Joint Committee on Indian Bureau Transfer.

[Copy referred to in the above.]

OFFICE DEPOT COMMISSARY,
Cheyenne, Wyo., March 21, 1878.

SIR: Referring to your telegram of this date, I have the honor to state that during the past eighteen months I have inspected for the Indian Department over fifteen hundred thousand (1,500,000) pounds of flour. A portion of this was purchased in open market by me at the request of the Hon. Commissioner of Indians Affairs. All that I have purchased in this way has been a "XXX" grade of flour, far superior as to quality to sample furnished me by the Indian Department. That portion of the flour offered on contract made by different parties with the Indian Department has been inspected in accordance with sample furnished me by the department or its agents. It has invariably, with one single exception, been an inferior grade of "XX" flour, at least twenty-five per cent. inferior to the flour graded as "XX" in the East. It has been flour that I would not touch at any price for issue to troops. When the flour offered for inspection was equal to the sample furnished me, I had no alternative but to pass it.

During the same time I have, under instructions of the chief C. S. of the Department of the Platte, purchased in the neighborhood of one million (1,000,000) pounds of flour for issue to troops in this military department. This flour has been of one grade only, and that the best made in Colorado—what they grade as "XXXX." It is far superior to flour furnished by the Indian Department in every respect.

My opportunities for judging of the comparative quality of the two flours have been of the best, and I do not hesitate to say that the flour I have been called upon to inspect for the Indian Department, offered on contract, has been of such inferior quality as to be comparatively worthless and unfit for issue.

Very respectfully, your ob't serv't,

W. H. NASH,
Capt. C. S., U. S. A.

WAR DEPARTMENT,
OFFICE COMMISSARY-GENERAL SUBSISTENCE,
Dec. 11, 1878.

A true copy.

T. S. HARRIS,
Maj. & C. S., Asst. to C. G. S.

To the COMMISSARY-GENERAL OF SUBSISTENCE, U. S. A.,
Washington, D. C.

WASHINGTON, D. C., 12*th mo.*, 12*th*, 1878.

RESPECTED FRIEND: My answer to one of Gen'l Hooker's questions upon my cross-examination before your committee on the 10th inst. has been erroneously reported in the newspapers. As I desire to stand correct upon the record, I will here state (and I ask that this statement may be read before the committee), that my reply upon that occasion was confined only to his special question, "What is your opinion of the result to the Indians if Army officers were appointed Indian agents and their agency employés appointed from civilians as at present?" Agency employés are at present nominated for appointment by religious organizations, and my answer applied to that situation alone, and not to a question of a transfer of the Indian Bureau to the War Department. Had my opinion been asked on that question, my reply would have been, "My honest conviction and opinion, founded upon seven years' experience in the Indian service, is that their transfer from the Interior to the War Department would be disastrous to them in its results, necessarily tending to check their present rapid advance in civilization and self-support."

Very respectfully, thy friend,

BARCLAY WHITE.

Senator SAUNDERS,
Chairman Indian Transfer Commission.

JOSEPH T. BENDER sworn and examined.

By Mr. SAUNDERS:

Questions. What is your name?—Answer. Joseph T. Bender.
Q. Where do you reside?—A. In Washington.

Q. What is your present business?—A. I am a clerk in the Indian Bureau.

Q. How long have you been a clerk in the Indian Bureau?—A. Nearly ten years.

Q. As clerk in the Indian Bureau, what particular branch of the business do you attend to?—A. I have charge of the financial branch.

Q. The papers and accounts, then, relating to the payment of debts, and contracts, and so forth, effected by the Indian Department, pass through your hands, do they?—A. Yes, sir.

Q. Well, what do you know as to the relative cost of the supplies and transportation and other financial matters as between your department and the War Department, or does it come within your province to inquire into that; have you any knowledge as to that?—A. That does not come within my province, sir. I know nothing of that excepting from hearsay.

INSPECTION OF INDIAN SUPPLIES

Q. Do you have anything to do with the inspection of goods?—A. With the direction of inspection; yes, sir.

Q. Who does the inspecting for your department, say for the Indians on the plains or for any other Indians?—A. Generally, military officers at the agencies.

Q. That is, the officers of the Army?—A. Yes, sir; the military officers at the posts connected with the agencies.

Q. Have you the power to detail an officer—that is, to request it; or do they detail just such as they see fit from the Army?—A. It is usually made at the request of the Commissioner of Indian Affairs, through the Interior Department, to the War Department.

Q. Do you know anything about their manner of inspection—whether they give a close inspection or whether it is done in a general way? Have you any knowledge as to that?—A. I have not, sir; I think, however, from what I understand, that it is done in a general way, a very general way.

Q. Well, how is this inspection made; is it made on the samples of goods furnished; that is, if they are called on to inspect a lot of flour, for instance, do you furnish a sample of the article that was presented at the time of bidding?—A. Yes, sir; they do.

Q. If it is found to be equal to the sample furnished, is it his duty to accept it?—A. Yes, sir.

Q. And if not, to reject it?—A. Yes, sir; to reject it.

Q. Does that same thing apply to other things besides flour? How is it with the beef?—A. Beef is inspected also by the military officer at all the agencies where there is a military post, or at those agencies lying near the military posts.

Q. Have you any rule by which cattle are inspected; do you give instructions in regard to that?—A. They are inspected according to the requirements of the contract; yes, sir.

Q. You furnish the inspector with a copy of the contract, do you; and if they come up to its requirements, they should be accepted?—A. Yes, sir.

POOR FLOUR FURNISHED TO THE INDIANS.

By Mr. STEWART:

Q. You heard the letter of Captain Nash read, Mr. Bender, and you were out in the Indian country last year, were you not?—A. Yes, sir; I was out there in November.

Q. Did you have any conversation with Captain Nash with reference

to his letter and report?—A. No, sir; I had no conversation with him in reference to his letter, but I inquired particularly in regard to his inspection of flour for our department, and especially in relation to the lot which he said was "unfit for human food."

Q. Well, did he not pass that same lot of flour?—A. He did, sir; passed it from the sample said to have been furnished him from the Indian Office; and a part of that sample he gave me—a part of the sample that he said was sent to him.

Q. Did you compare it with the sample sent?—A. I could find no sample of that lot of flour in the office. It was furnished two years ago last August or September.

Q. Well, what was his reply to the question?—A. That the flour offered by the party who furnished it was up to this sample, and he felt it his duty to pass it [handing the sample to Mr. Stewart]; it is a very poor grade of flour.

By Mr. HOOKER:

Q. It is a very poor grade?—A. Yes, sir; a very low grade, indeed. It seems that that sample was furnished to him by an employé of the department who had charge of the Indian warehouse at Cheyenne, this employé claiming that the sample had been sent to him through the Indian Office. Captain Nash's instructions from the office were to inspect a certain quantity of flour, which was to be "'XX' flour, made of good, sound, sweet wheat."

Q. Well, that is not "XX" flour, nor is it made of "good, sound, sweet wheat." The fraud, then, if there was a fraud, was practiced by the employé out there, you think?—A. Well, sir, I cannot find that any sample was sent to this employé from the Indian Office; I have searched the records; nor can I find any sample in the office with which this compares, or that appears to have been submitted by the party who furnished this flour. Captain Nash is now of the opinion that he was imposed upon by this man Bostwick, that I speak of, who was in charge of the government warehouse at Cheyenne. Captain Nash stated that he had inspected other lots of flour furnished by other contractors, and that in almost all cases the flour had been found to be very superior, and especially that furnished by a contractor named Wells, who had the reputation in that country of being an A No. 1 man. He had inspected all together, including this lot, in the neighborhood of 1,600,000 pounds for us.

Q. Then the flour he refers to was some that he inspected two years ago?—A. Well, it was two years ago—in August or September, 1876—that this flour was furnished.

Q. I understood you to say, Mr. Bender, that the sample of flour you have produced here was the sample which was furnished to Captain Nash?—A. That is a part of the sample furnished to him, and which he gave to me last November when I was in Cheyenne.

Q. I understood you to say that it was the duty of the inspector to inspect the flour, and if the flour furnished by the contractor came up to the sample furnished to the department, it was his duty to accept it?—A. Yes, sir.

Q. In point of fact, did the flour which he inspected come up to that sample?—A. If the sample is furnished by the department, then it is the inspector's duty, I think, to accept the flour that comes up to that grade. This sample, however, seems not to have been furnished by the department, but by an employé who claimed that it had been sent to him by the department.

Q. He presented it to Captain Nash, and Captain Nash, in determin-

ing whether the flour furnished by the contractor came up to the sample or not, was governed by this sample furnished?—A. Yes, sir.

Q. Who was that employé?—A. His name was Bostwick.

Q. Where is he now?—A. I think in the State of New York.

Q. Is he still in the employ of the department?—A. No, sir; and he has not been for nearly or quite two years.

Q. Was he dismissed on account of his action in this matter?—A. No, sir. He was dismissed because his duties were no longer required at the warehouse, it being determined at that time to close the warehouse.

Q. How long was he continued after it was known that he furnished that sample?—A. He turned this sample over when he was relieved from duty.

Q. When he was relieved, do you say?—A. He was no longer in the employ of the department after he turned this sample over.

Q. He had been removed because the necessity for the continuance of the warehouse ceased, and it was discontinued as a government depot of supplies?—A. Yes, sir; it had been determined to no longer keep it as a depot of supplies.

Q. What amount of flour was thus furnished to the Indian Department?—A. My recollection is that it was nearly 400,000 pounds.

Q. About $9,000 worth?—A. Yes, sir.

Q. You say you have charge of the financial department of the bureau; in other words, it is through your department that the annuities are paid, is it?—A. Yes, sir.

Q. What do you mean by your having charge of the financial department? What are your duties?—A. I am chief of the financial division, sir.

Q. What are your duties as chief of this division?—A. My duty is to make the payments for supplies and remittances for the agency expenses, and payment of the annuities due to Indian tribes.

Q. You pay the accounts, in other words, which the department makes with these contractors, and you pay the annuities whenever the annuities are paid in money through the agent?—A. Through the Indian agent.

Q. That is my understanding of it.—A. Yes, sir; through the agent who has charge of the Indians to whom the money is to be paid.

Q. It passes through his hands?—A. Yes, sir.

ANNUITIES PAID THE INDIANS.

Q. In reference to the payments which have been made to the Winnebago Indians in Nebraska, are they paid their annuities in cash or in goods furnished to them?—A. Principally in goods, sir; very little money is paid to them now.

Q. Very little money?—A. Yes, sir.

Q. When was money paid to them last?—A. I am not sure whether any money was paid to them this year or not. I think a small amount, some three or four thousand dollars, was paid to them last year.

Q. Through whom?—A. Through the agent.

Q. Howard White?—A. Yes, sir.

Q. Paid how? Per capita?—A. In what way do I understand you?

Q. Per capita.—A. About three dollars and a half per head, if I am correct in the amount.

Q. Are you certain that that was paid to them last year?—A. No, sir.

Q. Are you certain that any has been paid to them the last two years?—A. Not absolutely certain, sir.

Q. Are you certain that any has been paid to them the last three years?—A. Yes, sir; reasonably so.

Q. Well, when you talk in that way, do not your books in the office show?—A. Yes, sir; but I had not charged my mind with looking up that matter especially. There are quite a number of transactions of that kind, and it would be impossible for me or any one else to recollect them all, sir.

Q. Have you not recently furnished a statement of the amount of annuities paid to the Winnebago Indians, and the manner in which they were paid?—A. Not to my knowledge; I have not, sir.

Q. You were referred to as having given such information, I believe?—A. I was referred to as one who could possibly give some information in regard to the depletion of the principal of the Winnebago fund; but that is not the annuity money.

TRUST FUND OF THE WINNEBAGOES.

Q. Yes, I understand that, sir. What is the amount of the principal upon which the government pays the interest to the Winnebagoes?—A. It is about $885,000, I think.

Q. Eight hundred and eighty-five thousand dollars? What was it originally?—A. It is $883,249.58 at present.

Q. What was it originally?—A. Eleven hundred thousand dollars.

Q. Eleven hundred thousand dollars? Under what treaty was that amount stipulated to be paid?—A. The treaty of 1837 was the one under which that amount of $1,100,000 was set apart for the benefit of the Winnebagoes.

Q. The treaty of 1837? It is under the ninth article of that treaty that this amount was to be paid, was it not?—A. Yes, sir.

Q. The principal, then, on which the government agreed to pay them 5 per cent. interest per annum, was $1,100,000?—A. Yes, sir.

Q. The interest on that would be $55,000 per annum, would it not?—A. Yes, sir.

Q. Of that amount, are you aware what proportion the Winnebagoes agreed should be deducted for the purpose of education, for the support of their schools, and for the support of the interpreter, and the miller, and the farmer, and for the supply of agricultural implements?—A. Not without looking at the treaty, sir.

Q. Explain to the committee, if you please, Mr. Bender, when it was, and how it was, that this principal of $1,100,000, which by the treaty of 1837 was set apart to the Winnebagoes, and was to bear interest at the rate of 5 per cent. per annum, was reduced in amount from $1,100,000 to the amount which you now say it is?—A. By the treaty of 1846, article 4 (it will be found in Statutes 9, page 878), this principal was partially increased by the sum of $85,000.

Q. The principal?—A. Yes, sir.

Q. Which would make it $1,185,000?—A. Yes, sir.

By Mr. BOONE:

Q. What page of the Statutes did you say?—A. Statutes 9, page 878, article 4. By a joint resolution of Congress of July 17, 1862, $50,000 was appropriated from this principal, to be expended for the benefit of the Winnebagoes.

By Mr. HOOKER:

Q. Fifty thousand dollars?—A. Yes, sir.

Q. In what way was it expended?—A. I do not recollect the terms of the resolution. It is in Statutes 12, page 628. That left the principal,

in 1862, $1,135,000. By act of March 3, 1863, same Statutes, page 785, a further sum of $50,000 was appropriated, to be taken from the principal.

Q. Which made $100,000 in the aggregate?—A. Yes, sir. And that left the principal $1,085,000.

Q. That is, $100,000 deducted by the two acts of Congress?—A. Yes, sir. By act of July 15, 1870, which will be found, I think, in Statutes 16, page 361, Congress provided for setting apart lands for certain of the Winnebagoes—for those, I think, who were able to prove that they could take care of their own affairs—and provided, also, that those that became citizens under that act should be paid their proportion of the tribal assets.

Q. When you say "tribal assets" what do you mean?—A. I mean their proportion of the principal fund of the tribe.

Q. What principal?—A. The amount to their credit on the books of the Treasury, belonging to them, arising out of the interest and their principal. I should state, however, before this, that by that same act of 1870, $200,000 was appropriated, to be added to the principal, which made the principal $1,285,000. Then by the act of March 3, 1871, Congress appropriated, to pay members of the tribe who had become citizens under the act of July 15, 1870, $134,291.30.

Q. Designating them by name?—A. No, sir; to pay certain persons who had become citizens.

Q. Well, I ask, did they designate the Indians by name?—A. No, sir. I think, however, it specified the number, according to a list on file in the Interior Department, and approved by the Secretary. That left the principal $1,150,798.70. By act of May 29, 1872, a further appropriation was made to pay members of the tribe who had become citizens.

Q. How much was then appropriated?—A. One hundred and ten thousand one hundred and sixty-one dollars and eighty-four cents; leaving of the principal $1,040,636.86. By act of June 22, 1874, Congress appropriated $82,000 to buy lands for the Omaha Indians, to be given to some of the Winnebagoes who had been recently removed from Wisconsin to Nebraska, and to settle them on the lands bought from the Omahas. That reduced the principal to $958,636.86. Then, by act of Congress of August 15, 1876—or rather, to go back to the $85,000 that was added to the principal by the treaty of 1846. The government agreed to pay them interest on that $85,000 for thirty years, the sum so paid in thirty years to be in full payment of this amount.

Q. What amount?—A. In other words, the government agreed to pay interest on $85,000 for thirty years, and then the principal was to drop out.

Q. What $85,000 do you refer to?—A. The $85,000 that was added to the principal by the treaty of 1846, which was the first increase after the original sum was placed to their credit.

Q. Well, that amount, then, is really not a permanent fund, but was only an amount upon which the government agreed to pay 5 per cent. for thirty years?—A. Yes, sir.

Q. And at the expiration of thirty years the principal ceased to exist?—A. Yes, sir.

Q. Then it was not really an addition to their permanent fund?—A. Well, it was treated as an addition, because it increased their income.

Q. And at the expiration of that time it ceased to be a portion of their fund?—A. Yes, sir; ceased to be a portion; and inasmuch as it has been considered all through this statement as a part of the principal, from the time it was placed to their credit, I have taken it out after the

lapse of the thirty years, which leaves the principal at the present time $883,249.58. That is the amount on which the Winnebagoes are now receiving interest.

Q. Now, how do they receive that?—A. They receive it in money and in goods.

Q. What proportion in money, and what proportion in goods?—A. Well, I should state that they do not get all of it; that is, all the amount appropriated each year by Congress is not used. Under an act of 1864, I think it was, Congress provided that the proportion due to those Winnebagoes who were then in Wisconsin should be withheld.

Q. In what year was that?—A. I think it was in 1864; I am not sure.

Q. What was done with the sum so withheld?—A. It was retained to their credit on the books of the Treasury, to be disposed of by future legislation of Congress.

Q. In what proportion was the sum retained fixed?—A. A proportion of whatever belonged to them, pro rata according to the whole number of the tribe in Nebraska, and to the number in Wisconsin.

Q. In point of fact, in order to withhold it, you had to ascertain what proportion was on the reservation, and what proportion was in Wisconsin. What was, in point of fact, the amount retained?—A. I think about one-third of the whole—probably a little more than one-third.

Q. And that has been retained ever since the passage of that act?—No, sir; only for the past three or four years.

Q. What was done with it before?—A. It was expended for the Winnebagoes in Nebraska.

Q. The whole of it?—A. Yes, sir.

Q. And only retained the last three or four years?—A. Yes, sir; the first amount retained was by order of Secretary Chandler, who was at that time the Secretary of the Interior.

Q. Do you remember the date of the order?—A. No, sir.

Q. What was the year?—A. I think it was the first year that Mr. Chandler was the head of the department.

Q. It was retained, and has not been paid either to the Nebraska Winnebagoes or Wisconsin Winnebagoes?—A. Yes, sir; I think $16,170 each year since the date of that order.

Q. That is out of the interest of 5 per cent. per annum due on the principal sum you have just named of over eight hundred thousand dollars?—A. Yes, sir.

Q. Now, what proportion was paid to the Nebraska Winnebagoes in money and what in supplies?—A. I think not more than one-seventh in money and the balance in supplies and for other purposes.

Q. For what other purposes?—A. For paying the salaries of employés at the agencies, running the schools, &c.

Q. That is the way in which it is expended?—A. Yes, sir.

Q. And for the last three years you are not aware whether any per capita money has been paid or not?—A. I could not speak positively, sir; but I think there has been a small amount only.

Q. A small amount to each head of a family?—A, No, sir; to each person.

Q. You think about three dollars and a half per capita?—A. Yes, sir; about that.

Q. How many do you estimate the Indians on the Winnebagoe Resrvation in Nebraska to be?—A. About fourteen hundred, sir.

Q. And the balance of this fund arising from the interest on the principal, less the sixteen thousand which was retained for the Wisconsin

Winnebagoes, has been annually paid to them in money and in supplies?—A. I do not think the whole of it has. I think there is a small accumulation for each year, for several years, still on the books to their credit.

Q. Who determines as to the proportion that shall be paid in supplies, consisting of clothing, agricultural implements, &c., and the proportion that shall be paid in money?—A. I think the treaty determines that.

Q. It is not a matter of discretion, then, with the Commissioner?—A. Well, to a certain degree it is, under the treaty. I think that under the treaty, it is left discretionary with the Commissioner, to a certain degree.

Q. How is that discretion exercised, in the matter, by the Commissioner—according to representations made by agents as to the necessities and wants of the Indians?—A. Yes, sir.

Q. As to the representations of the agents concerning the condition of the Indians?—A. Yes, sir.

INSPECTION OF SUPPLIES.

By Mr. STEWART:

Q. I would like to ask a little further about that flour. How much do you say Captain Nash inspected for the Indian Bureau?—A. I think about sixteen hundred thousand pounds.

Q. How much has he rejected?—A. I do not know that he ever rejected any.

Q. Did he notify the department immediately on the receipt of this sample that it was not fit for human beings to eat?—A. He did not, to the best of my knowledge.

Q. Then the first the department knew of it was when his letter appeared in the Congressional Record?—A. I do not know as to that.

Q. Well, is it not his duty to correspond with the department, or is he obliged to take the word of an employé?—A. Well, I think it was his duty to correspond with the department when he found that the sample was not of a good or even fair quality.

Q. Do you know what his views are now of the matter?—A. He is now of the impression that he was imposed upon by this employé.

By Mr. HOOKER:

Q. Was it not the duty of the agent of the Interior Department at this warehouse, or reception-house, at Cheyenne, to receive into it the goods which the contractors had contracted to deliver?—A. Are you speaking in regard to this flour, or of all goods?

Q. I am speaking in reference to the duties of the man who you say was at the head of this warehouse. Was it his duty to receive from the contractors, and put in store in the warehouse, the flour which was contracted to be delivered?—A. It was his duty to receive the flour after it had been inspected by the inspector.

Mr. HOOKER. That is all.

Mr. BOONE. I would like to ask the Commissioner, Mr. Hoyt, a few questions, as he is here.

Commissioner E. A. HAYT recalled and examined.

By Mr. BOONE:

Question. Who is at present, and has been for some time, agent at the Red Cloud Agency?—Answer. Dr. Irwin.

Q. How long has he been agent there?—A. For about two years.

Q. Are there any charges in your office against him for mismanagement?—A. There are no charges in the office against Dr. Irwin.

Q. Are there any charges against him anywhere, from which you have acted?—A. I sent an inspector there to examine into the affairs of the agency.

Q. Have you any information from the inspector to the effect that he has now taken charge of the agency, and preferred charges against Dr. Irwin?—A. I have a telegram from the inspector this morning, in which he states nothing of the kind. The statement you speak of is a newspaper rumor merely.

Q. You have, then, no official knowledge of any charges against Dr. Irwin?—A. None whatever.

Q. What was the occasion of your sending an inspector there?—A. I thought that Dr. Irwin had not been as efficient as an agent should be in looking after the removal of the Indians. He had been directed to remain on the Missouri River and dispatch the teams to the agency. I had sent another man to the agency to erect the buildings; and Dr. Irwin, without leave, left the river and went to the agency; and he showed a remissness that led me to send an inspector there to see that everything went straight.

Q. Had you no intimation of any dereliction of duty on the part of Dr. Irwin in any other respect?—A. I do not remember anything beside that.

Q. Who is the inspector that you sent there?—A. General Hammond.

Q. Is he there at present?—A. I received a dispatch from him this morning.

Q. He said nothing in his dispatch about his having taken charge of the agency, or that he had preferred charges or would prefer charges against Dr. Irwin?—A. Nothing of the kind.

Q. Does he report everything as satisfactory there?—A. He does not.

Q. Has he made any report?—A. He has not.

Q. What is the date of the dispatch; to-day, or yesterday?—A. I have it in my pocket. (Producing the dispatch.) It is dated December 9, 1878; Pine Ridge Agency, December 9, 1878, and that is the latest date at which it is possible to receive information from that agency.

By the CHAIRMAN:

Q. What agency did you say?—A. Pine Ridge Agency.

Q. Is that the name of the new Red Cloud Agency?—A. Yes, sir; the name was changed to distinguish it from the other Red Cloud agencies—the one in Nebraska, and one on the river.

By Mr. BOONE:

Q. Do you know at whose request Dr. Irwin was appointed?—A. I think on the nomination of the Episcopalians.

Q. Is he a minister or a physician, that he is called "doctor"?—A. I presume a physician; but I am not sure, even, that he is called "doctor."

TRANSPORTATION UNDER THE TWO SYSTEMS.

If you please, I would like to say a word in regard to the statement referred to by General Macfeely yesterday. General Macfeely stated that the transportion of the War Department was from the seaboard to the Missouri River by classification, and I have before me a paper that I was looking for the other day. (I received it while I was sitting here, but did not open it.) It has reference to the prices paid from New York to Sioux City.

If you will remember, I said that to transport our frieght from the seaboard to the Missouri River cost .65$\frac{29}{100}$ per hundred pounds. The regular classified rate, which I think General Meigs stated the Army

paid, and which I heard General Macfeely also state that the Army paid, was $1.75 per hundred pounds between New York and Sioux City at first-class rates. The second class is $1.35; third class, $1.10; and fourth class, .85 per hundred pounds. If, therefore, the Army paid the classified rates, they must have paid more than double the rate for transportation between New York and the Missouri River that was paid by the Indian Department.

PURCHASE OF BEEF.

Another matter stated by General Macfeely, yesterday, in regard to beef. It does not follow, as a rule, if you want to buy a small quantity of beef, that you cannot buy it at as low a price as a large quantity of beef. It often happens that the men who have the supply of a military post or agency, have small herds of beef which they are willing to sell at a lower price than they would contract to supply a large quantity deliverable during a whole year. There is always a risk in contracting to supply a large quantity, and the contractor has to bear this in mind, that he may be called upon to deliver beef when beef may have advanced in price. During the last fiscal year one contractor asserts that he lost $40,000 by filling a contract for beef, simply because at a certain time, in the spring of this current year, beef had advanced in price. Now the quantity bought does not determine the question as to whether it is bought cheaply or not; and in my judgment you can buy what the Army needs as cheaply, if you take the pains to do so, as we buy for the Indian Department.

Now, General Macfeely also said, in regard to the agencies, that sometimes they did not take whole beef. We did not take into the comparison any agency or post where they did not take whole beef. On the contrary, we took only the largest posts. For instance, at Fort Reno there are 214 men; at Fort Sill, 323 men; at Standing Rock, 327 men; at Fort Shaw, 312 men. And so we made the comparison between ten different posts, where the military post and the Indian agency were contiguous, and where the test would be a fair one; and that statement was made by the Secretary, I think, in the first place. He, however, did not add the fact that, at the same rate, the whole purchases for the bureau would have cost the government $644,000 more than it did cost under the Indian service.

Now, it seems to me it is the only fair way to test the relative cheapness of the purchases by comparing those posts and agencies where they get just about the same beef. For example, at the Fort Hall Agency it is of the same quality; and at the Blackfeet and Standing Rock Agencies and posts the beef is delivered to each out of the same herd. The contractor for the Indian Department has an interest in the contract for the Army. At Cheyenne River and a number of other places they take the same beef identically; and yet, in all cases, without any exception, the Army pays a higher price than we do. And the average—where we can fairly contrast it, taking the agencies where the posts are contiguous—shows a difference of $1.40 a hundred pounds, as against the Army purchases; or, if applied to the whole quantity purchased, at the same ratio, an aggregate cost of $644,000 more than if purchased by the Indian Bureau.

CAPTAIN NASH'S INSPECTION OF FLOUR.

There is one thing about this flour at Cheyenne, inspected by Captain Nash. It was clearly Nash's duty, when he found that the flour was "unfit to eat," to inform the department. I do not believe that any civil agent, inspecting for the government, would feel himself justified, if he

found flour "unfit to eat," if he failed to inform the bureau of the fact. I have searched the records of the office to see if I could find any trace of a sample of that flour, sent from the office to Captain Nash, but do not find any letter sent, as would be the case had such sample been sent from the office. I do find a telegram from the Commissioner of Indian Affairs, dated August 3, 1876, in which he directs Captain Nash to inspect "XX" flour, made of good, sound wheat; and with that direction in his hand, and the quality of the flour before him, if he had discharged his duty conscientiously and faithfully, as an officer of the government is bound to do, he would not only have notified the government, but refused to receive the flour on finding that it did not conform to the requirements of the Commissioner's dispatch.

Now, as to the quality of the beef, to show that it is good, we are obliged by law, wherever there is a military post near the agency, to call on the military to send an inspector; and the beef that we receive at all these agencies is passed upon by a military inspector as "good, merchantable beef," and the requirement of our contract is such that only well-selected or wintered Texas cattle will fill it at certain seasons. The statements made in this beef matter on behalf of the Indian Bureau are fully warranted in every respect.

I wish to recall attention to another point that was only touched upon briefly the other day. The estimate of the War Office this year for transportation is $4,400,000. Last year the appropriation was $4,200,000. Now, when it is considered that the whole appropriation for the Indian Bureau, for supplies, clothing, annuities, transportation, and all, amounts to $4,710,000, I think we are justified in comparing the economy of the management of the Interior Department, at the present time, with that of the War Department, and in saying that the comparison is largely in favor of the Interior Department, as conducting its affairs efficiently, on true business methods, and as looking out for the interests of the government wisely.

By the CHAIRMAN:

Q. This flour transaction took place before you became Indian Commissioner—in 1876—did it not?—A. Yes, sir; I have been Commissioner only a year and two months.

PURCHASE OF BEEF.

By Mr. HOOKER:

Q. You were speaking with reference to the cost of the beef. Is it true that the beef is furnished to the Army on the block, and the beef furnished under the Indian contracts is on the hoof?—A. They buy it at the net price. At a great many posts it is furnished on the block, where they take but a small quantity; but at the larger posts, where they require a considerable amount of beef, it is estimated as cattle on the hoof.

Q. Yes, I am aware of that; but are your contracts for the Indians not all for cattle to be delivered on the hoof?—A. They are for this current year. Last year we bought net beef.

Q. But this year you buy on the hoof?—A. Yes, sir.

Q. How is it generally done?—A. Generally on the hoof.

Q. On the hoof?—A. Yes, sir.

Q. Now, do you wish the committee to understand you to say that the character of the beef bought for the Indian service is as good as that bought for the Army?—A. I mean to say that it is generally; there are doubtless exceptions; but take it generally in the points I have compared, we get the same quality of beef.

Q. The beef is furnished on the block to the Army at most of the posts, is it not?—A. That is an arrangement that makes some difference, but the butchers get the benefit of the hides. In our case, buying on the hoof, we get the benefit of the hides. The hides will pay for the butchering.

Q. Would not that account for the difference in the price of the beef?—A. O, no.

Q. And you think the quality is the same?—A. I do not say that; but in many instances they are taken out of the same herd. They have taken the cattle out of the identical herds in some points where I have made the comparisons; one man furnishing beef to the Indians was also interested as partner in a contract to furnish beef for the Army. And beef for the Army is not always bought in small quantities. They have a regular letting of the contract, and take the number of cattle required at the posts, and where the posts are large they buy a great deal of beef.

Q. But is it not true that they are obliged to furnish a larger quantity where the garrison is large than where it is diminished?—A. Undoubtedly that is true. The number of troops may be diminished by the breaking up of the garrison, and, therefore, the contractors have to run a risk as to the numbers.

Q. Whereas your Indians, in the Interior management, are pretty accurately determined, and you know pretty well the number you have to supply?—A. Yes, sir; we do.

CAPTAIN NASH'S INSPECTION.

Q. Now, in reference to the flour, do you undertake to say that it was not the duty of this inspector, Captain Nash, selected to inspect this flour, to compare it with the sample furnished to him as coming from the department, and to be governed by the correspondence of the article with that sample?—A. If you take his statement that the sample of flour was "not fit to eat," I maintain that it was not his duty to inspect by it without informing the bureau of the state of the case.

Q. Suppose, however, that the contract had been made for the delivery of flour of that grade, and that the flour delivered corresponded with the sample furnished from the department, would he have no duty to perform in the matter other than to say that the contractor had furnished flour equal to the requirements of the sample?—A. That would be considered very loose inspection, and such an officer would not really be entitled to be called an inspector. An inspector in the civil service is an expert in the article he undertakes to inspect for the government. He needs to know not only whether the flour is good, but whether it is up to the standard or below. Where we are obliged to use a military officer as an inspector, he is not always an expert, and then he calls in a civilian. Now if he called in a civilian who is an expert then he would get an accurate test, but if he failed to do so, he would not.

Q. But if the department had chosen to make the contract for delivery of so much flour at this warehouse, corresponding with the sample furnished, would he have had any right to surpervise the contract made by the department or to change it?—A. He could not change the contract, but it would be his duty to inform the office that the flour was "not fit to eat." Now, Captain Nash was informed and knew this. He also knew that the grade of flour required by the department was New York "XX," and that grade of flour is well known; it is the best flour in New York until you come to what are called the fancy brands, for which higher prices are paid.

Q. If, in point of fact, Mr. Commissioner, this sample (which seems not to have been authorized to be sent by the department) had come from the department, and the flour as delivered agreed in quality with the sample, would he not have been bound to accept it?—A. I think not; and for this reason: when he found that the flour was "not fit to eat," it would have been a natural presumption in his mind that it was not the intention of the department to furnish flour that was "not fit to eat." It was his duty at once to notify the department of the fact, by wire, which he could have done in a few hours; and as there was no hurry in the inspection, which should be an act of deliberation, he had plenty of time; and before saddling upon the government flour which he knew was "not fit to eat," he should have communicated the fact to the office, even if the sample had been a legitimate one, and that had been the flour contracted for.

Q. Would it not then have been his duty to pass the flour?—A. Not at all. It would have been his duty to reject it, and to publish to the world that the Indian Bureau had contracted for flour that was "not fit to eat."

DISHONEST CONTRACTOR.

Q. Who was the contractor that furnished this flour?—A. Dwight J. McCann, who is at present in the penitentiary for defrauding the government.

Q. For defrauding the government in connection with this transaction?—A. Not on this flour transaction. The charge on which he was convicted was this: he received some sugar at Sidney to transport to the Blackfeet Agency. He took the sugar out of barrels and had it put in bags and sent it to the Black Hills, sold the sugar for money and put the money in his pocket.

Q. The inspector?—A. No; the contractor, McCann.

Q. Was he a contractor for the Indian Bureau?—A. For the Indian Bureau; but he is no longer a contractor!

Q. I understand. How long prior to that time was the flour transaction?—A. A year or more.

SUPPLIES OF BEEF.

By Mr. BOONE:

Q. One question more about this beef. You stated, Mr. Commissioner, that the supplies for the Army and for the Indian service are sometimes furnished out of the same herd. Now is it not true that the contracts for the Army and for the Indian Department differ very materially in the requirement of both quality of the beef and size of the cattle?—A. I think the requirements of our contracts are superior to those of the Army.

Q. In what respects?—A. We require uniform weight; the stock must be in good condition, and must net 50 per cent. of the gross weight; to secure this an Army officer is called in, and he has to decide whether the beef is up to this standard of weight, &c.

Q. What gross weight do you require?—A. Eight hundred and fifty pounds per head.

Q. Are stags excluded from your bids?—A. Yes, sir; stags and bulls, and we take off 20 per cent. for cows. In this respect our contracts are better than those of the Army. If, for instance, a cow weighs 700 pounds gross, we pay only for 560 pounds.

Q. Is it not true that the cattle in some herds may differ very materially in value for beef-cattle?—A. It is, undoubtedly. I would say in addition that we have an offer from a butcher to kill the cattle for our

Indian agencies, and pay seventy-five cents a head to the government for the privilege of butchering. He will pay us that and take the hides and the offal for his compensation.

Inspector E. C. WATKINS recalled and examined.

By the CHAIRMAN:

Question. Please tell the committee what you know about that flour transaction. You have heard it talked of here this morning. Were you connected with it in any way?—Answer. No, sir; I know nothing about the transaction testified to this morning. I know, in a general way, about the flour and beef furnished to the Indian Department and the Army. I have inspected a good deal of flour and beef, but I had nothing to do with this particular case. I can speak of the flour at the San Carlos Agency. The contract last year was for six hundred thousand pounds of flour. It was the same quality as that furnished to the military post at Camp Thomas, adjacent to the reservation. It was of very excellent quality, as good a quality as is made in the Territory of New Mexico or in Colorado.

Q. Have you paid some attention to this inspection business?—A. Yes, sir; I have.

MANNER OF INSPECTION.

Q. How is it managed?—A. It is done by sample.

Q. Sample furnished of the flour contracted for, and if he finds it equal to the sample, or better, it is accepted, is it?—A. Well, our contracts state that the flour to be furnished shall be equal to a "double extra" flour under the New York inspection, and equal to the sample furnished; so that these two requisites are taken into consideration in inspecting flour. If I find a sample at an agency that is inferior, although the flour delivered may be equal to the sample, I do not receive the flour upon the score that it is equal to that sample, because it is not equal to a "double extra" grade according to the New York inspection. That would be a question that could be referred back to the Department and contractor for settlement. I reject flour if it is not good flour, because the grade received by the board, to my knowledge, is a good grade.

Q. You have never had a case of that kind to test you as to what direction you would give to it, have you? This seems to be a case of its own, without any precedent. The party there, from what we can learn, acted upon the sample, but that sample seems not to have been from the department here?—A. I have had no case similar to that, where the sample was claimed to have been sent from the department and was not. The quality of beef furnished at many of the posts and agencies is exactly alike. I have seen them in hundreds of cases. The same class of cattle is taken from the herd. For the military posts the cattle is taken, killed, dressed, and delivered from the block. That for the Indian agencies is taken to a corral, and kept twelve hours before killing, and then killed in the same manner and issued from the block. In some cases the Indians have dressed them themselves; that is being done away with, however.

By Mr. STEWART:

Q. I would like to ask you what you think of that flour [handing the sample]?—A. I shall have to test it, in order to tell [taking it to the light, and using a microscope]. That is an inferior grade of flour in my judgment; it would not come up to the requirement of the rules of the Indian service.

Q. Well, suppose you received flour of that kind, that was "not fit to eat," what would be your duty in the matter?—A. I would not receive such flour; I would reject it, and at once notify the department of the fact. I think the requirements of the contracts are such that an inspector has the right, and it is his duty, to reject flour of poor grade, even though it may be equal to the sample furnished, because there is the other provision that it shall be equal to the "double extra" grade of New York.

By Mr. HOOKER:

Q. So that, in the event you were inspecting flour at a post and you found it to fall a fraction below the "double extra" quality, you would consider it to be your duty to reject it, although it might conform to the sample furnished by the department?—A. If it was of a very poor grade, I should, sir.

Q. But suppose it should fall at all below the grade of "double extra," according to the New York sample, would it be your duty in that case to reject it?—A. Circumstances might govern me in that case; but it would be my duty to report it back to the department.

Q. If in the mean time the flour should be needed for use, what course would you take?—A. I should call a board of survey, and receive it on a reduced valuation, placed upon it by the board of survey, which is in accordance with the law.

SAMUEL M. JANNEY affirmed and examined.

By the CHAIRMAN:

Question. What is your name?—Answer. Samuel M. Janney.

Q. Where do you reside?—A. Near Leesburg, Va.

Q. What is your position in relation to Indian affairs?—A. I was for a number of years superintendent of Indian affairs in Nebraska, at the time Governor Saunders knew me.

If it be the pleasure of the committee, I would like to give my testimony on this question as embodied in the statement I have here, which represents the views of members of the central executive committee of the seven Yearly Meetings of the Friends' Society.

Q. Do you wish to present that as your statement upon the question before this commission?—A. Yes, sir.

[The testimony was received, as follows:]

The undersigned, members of the central executive committee of the seven Yearly Meetings of Friends having the care of the Indian agencies in Nebraska, and of the Pawnee Agency in the Indian Territory, respectfully solicit the attention of the Indian Transfer Commission to a concise statement of facts relating to Indian civilization, which have come under our own observation since we have been engaged in the Indian service. This statement will embrace the motives which induced President Grant to call us into this field of service, the condition in which we found the Indians placed under our care, the measures adopted for their improvement, and the results that have attended our labors. At a meeting of our committee on Indian affairs held in Baltimore in the spring of 1869, the following letter, addressed to our secretary, was read:

"HEADQUARTERS ARMY OF THE UNITED STATES,
"*Washington, D. C., February* 15, 1869.

"SIR: General Grant, the President elect, desirous of inaugurating some policy to protect the Indians in their just rights and enforce integrity in the administration of their affairs, as well as to improve their general condition, and appreciating fully the

friendship and interest which your society has ever maintained in their behalf, directs me to request that you will send him a list of names, members of your society, whom your society will indorse, as suitable persons for Indian agents.

"Also to assure you that any attempt which may or can be made by your society for the improvement, education, and civilization of the Indians under such agencies will receive from him, as President, all the encouragement and protection which the laws of the United States will warrant him in giving.

"Very respectfully, your obedient servant,

"E. S. PARKER,
"*Brevet Brigadier-General, U. S. A., and Aid-de-Camp.*

"BENJAMIN HALLOWELL,
"*Sandy Spring, Md.*"

After due deliberation and consultation by committees of the several meetings of Friends in correspondence with us, we concluded to accept the important trust; and in a circular addressed to our members, the qualifications desired and needed in Indian agents were thus described:

"1st. A prayerful heart, and a firm trust in the power and wisdom of God, and not in man or military force, for guidance and protection.

"2d. Industry, economy, firmness, vigilance, mildness and practical kindness and love.

"3d. A knowledge of farming and gardening, ability to superintend the construction of buildings, and see that schools are properly conducted.

"4th. Tact in managing or influencing persons, so as gradually to induce the Indians of his agency voluntarily to join in the various employments of farming and gardening, and in mechanical operations.

"5th. And, high in the scale of qualifications, to be possessed of strict integrity, and to be perfectly reliable in financial matters, and know how to employ, with economy and to the best advantage, the funds intrusted to him by the government for the use of the agency."

The Northern Superintendency was assigned to us, comprising six agencies in the State of Nebraska, namely, the Santee Sioux, the Winnebago, the Omaha, the Pawnee, the Otoe, and the Great Nebraska. We nominated a superintendent and six agents, who were promptly appointed by the President and confirmed by the Senate. They proceeded to their several fields of labor in the spring and summer of 1869. In order to secure efficiency and fidelity in the management of the agencies, it was recommended to the several Yearly Meetings of Friends that a visiting committee should be sent out every year to inspect the condition of the Indians and recommend such measures as would promote their welfare. Clothing for the children attending school, and suitable food for the sick and infirm, were supplied by the Indian committees of the Yearly Meetings. The first visiting committee went to all the agencies in the summer of 1869, and reported the condition of the Indians in Nebraska as follows:

"These wards of the government were found in a very depressed and degraded condition, as a general thing; poor, hungry, and idle from want of means and inducements to labor, destitute of suitable clothing, complaining of unfulfilled treaty stipulations, living in lodges with several families in a single apartment, thus excluding that healthful privacy which decency and virtue require. The lodges dark, unventilated, often filthy, and as a consequence of this condition sickness extensively abounding, especially among the children, scrofulous gatherings and ulcers, sore eyes, debility, and consumption."

The measures we adopted to promote civilization were—

1st. The establishment of schools, and the improvement of those already existing; care being taken to employ teachers whose moral influence would promote the growth of virtue. At all the agencies Sabbath-schools were held, in which Scripture lessons, blended with religious instruction, were given to the children and such of the adults as were willing to attend.

2d. The allotment of lands in severalty to the tribes willing to accept them. The Santee Sioux, the Winnebagoes, and the Omahas expressed, in council, their willingness to have their lands allotted in families, which was done soon after we took charge of the agencies. It has proved to be a great stimulant to industry, and a very large number of cultivated farms supply a comfortable subsistence to their owners.

3d. The distribution of agricultural implements, live stock, and seeds. At first, white men were employed to instruct the Indians in the use of tools and methods of farming; now, they have generally learned to depend on themselves.

4th. The instruction of Indians in mechanical employments. Many of them have learned to be carpenters, blacksmiths, shoemakers, and millers.

5th. The building of houses on their allotments. In most cases the Indians, when supplied by the agents with doors, window-sash, and flooring boards, have built their own houses of logs; in some cases houses have been built for them.

6th. The employment of matrons to instruct the Indian women in household duties

and the care of the sick. The peculiar adaptation of women for this work has been too much overlooked in the efforts that have been made to civilize the Indians. It has been found by experience that an enlightened and good woman who will go among the Indian women and manifest an interest in them and their children, can soon gain their confidence. She may instruct them in the proper care of their children, and in other household duties, and she will often find opportunities of imparting religious knowledge, which, being associated with deeds of love, will make a lasting impression.

The results that have attended our efforts to civilize the Indians in Nebraska have in general been very satisfactory. The last report of Barclay White, Friends' special agent, who visited all the agencies during the past summer, is encouraging. He says: "I have found the Indians at all their agencies peaceable, well disposed toward the government, and favorable to the continuance of the peace policy, as it was inaugurated by President Grant in 1869, in the management of their affairs.

"During the settlement of Nebraska, prior to the year 1871 records each year numerous murders of white persons by Indians. Since 1871 no Indian belonging to either of the seven tribes placed in our care has been guilty of, or charged with, taking the life of a white person; and although in several instances Indian members of those tribes have been wantonly killed by white men, they have sought no retaliation, but in all cases have left the punishment of the offenders to the authorities and the law.

"The advancement of those Indian tribes in civilized pursuits tending to make them self-supporting when the wild game is beyond their reach, has been great in the aggregate, and with some of the tribes very remarkable, especially so in agriculture, resulting, during favorable years, in a production of food fully equal to the needs of the members of the tribe."

In the year 1869 the Winnebagoes were so idle and improvident that they raised but little wheat or corn. They depended chiefly for subsistence on rations of flour and beef issued to them by the government. The expenditure to supply them for one year was, for beef, $18,233.68; for flour ground from wheat, $9,739.04; and for salt, $106.40, making an aggregate of more than $28,000. These issues of subsistence supplies have gradually been reduced in quantity as agriculture has advanced in the tribe, until the Indians have become independent of others, and are self-supporting.

The Winnebagoes number 1,454 persons. Last year they raised 8,000 bushels of wheat, 30,000 bushels of corn, and 5,000 bushels of potatoes. One hundred and seventy-five persons can read English, and their three schools have about 100 pupils. They have 125 houses, and nearly all the males wear citizens' dress.

The Omahas number 1,001 persons. Their crops last year were 17,000 bushels wheat, 32,000 bushels corn, and 6,000 bushels potatoes.

The Santee Sioux number 757 persons. They raised last year 10,000 bushels wheat, 9,000 bushels corn, and 1,800 bushels potatoes.

The Otoes number 443, the Iowas 213, and the Sacs and Foxes of Missouri 107 persons. The aggregate of their crops raised by Indians was 17,779 bushels wheat, 40,000 bushels corn, and 2,150 bushels potatoes.

The Pawnees, at their own request, were removed by the government to the Indian Territory in the year 1875, and a reservation was assigned to them there. They have suffered much from sickness caused by malaria, and have lost by death nearly one-third of their number. They now number 1,438 persons. Under such discouraging circumstances, no progress in civilization could be expected, but their health has improved during the last year. They are building houses on their allotments, and manifest much interest in the education of their children.

In the report of Barclay White, Friends' special agent, he writes: "Since the time when the President elect, U. S. Grant, tendered to the Society of Friends the nomination of officers in the Northern Indian Superintendency and its branches, and, upon its acceptance of the trust, stated to its representatives, 'Whom you nominate and indorse I will appoint,' the society has exercised much vigilance and care in its selection of moral, honest, and competent Christian missionaries to fill the various positions connected therewith, and results have proven that it has generally been eminently successful in its nomination of agents. Most of the Indian agents whom it has placed in the arduous and illy-paid government service, which is encompassed with privation, calumny, and responsibility, have been as competent, honest, and faithful servants of the government as can be found in any of its departments. Not one of the eighteen Indian agents nominated by Friends and commissioned by the President has proven unfaithful to the trust committed to him.

"Under the care of the Interior Department our Indians are in the aggregate making good progress, and some of them very rapid advancement in civilization and self-support. They have given the government no trouble during the year on account of belligerent acts. The question of their transfer to the War Department has been considered and discussed by each of the tribes during the summer. They are almost a unit in opposition to it. I believe such a transfer would not only be a great misfortune to the Indians, but would be calculated to add to the long list of injustice, broken faith,

and strife, of which we have already far too much upon the historical records of this country."

We heartily concur in the opinion expressed by Barclay White, that it is not expedient to transfer the Indian Bureau to the War Department. It is well known that for many years that department had the control of Indian affairs, during which time wars with the Indians were frequent, and very few of the tribes made any progress in civilization.

The peace policy inaugurated by President Grant is, in our opinion, the only safe and sure method to prepare the Indians for performing the duties of American citizens and enjoying the blessings of Christianity.

SAMUEL M. JANNEY.
B. RUSH ROBERTS.
BARCLAY WHITE.

Q. You wish to give this as your opinion?—A. Yes, sir; and as a statement setting forth my views of the method of civilizing Indians. It should be by kindness and not by force.

G. H. GIDDINGS sworn and examined.

By the CHAIRMAN:

Question. What is your name?—Answer. G. H. Giddings.

Q. Where do you reside?—A. In Texas.

Q. What is your occupation?—A. Previous to the war I was a merchant and contractor with the government.

Q. We are questioning witnesses here on the subject this commission was appointed to consider, namely, the propriety or impropriety of transferring the management of the Indians from the civil bureau to the War Department. Have you anything to offer on that subject?—A. I have had a good deal of bidding to do for contracts, and my business has brought me in contact with the Indians a good deal. I am ready to answer any questions you wish to ask me.

THE TRANSFER SHOULD BE MADE.

Q. I do not know that I have any questions to ask you; but if you have anything to offer, we shall be glad to have it. I know about your business as contractor, but if you have any knowledge or experience in the matters pertinent to our inquiry, you may go on and state them in your own way. We should be glad to get your opinion as to the question of turning the Indian service over to the War Department, and your reasons for such opinion.—A. I have always been of the opinion that it would be best for the Indians and the government if they should be turned over to the War Department.

Q. You think it would be better for the Indians and better for the government also?—A. I have always thought so.

Q. Better for the government from a financial or economical point of view?—A. Yes, sir; I see no reason why an Army officer cannot purchase supplies as cheaply as an Indian agent. As a general thing, I think they are more competent.

Q. You think that they do purchase supplies?—A. Well, I do not know that they have had the purchase of Indian supplies to any great extent; but I will say this, in reference to the beef, I have bid several times on beef contracts for the Indians, and I never succeeded in getting one; I was always underbid.

Q. Were you the lowest bidder?—A. No, sir; I went in 1869 and 1870 to the large lettings of the Indian Department at Chicago, and bid on everything, and bid as low as I could, but the beef, particularly, was bought for a price so low that it was impossibe to be delivered, according to my judgment. I inquired around a good deal, and they told me

that they depended on overestimating the cattle, or overcounting, in order to make their profit.

Q. How long ago was that?—A. In 1869 and 1870.

Q. Do you know any case of the kind lately?—A. I was trying to think if I bid in New York two or three years ago; but I think I did not—thought it would be of no use.

Q. Did they make the same requirements then that the military does now, limiting as to weights and qualities?—A. Well, my recollections as to contracts are not so clear as with the War Department. The beef delivered to the War Department must generally be delivered from the block, and to the Indians, as I understand it, on the hoof, in large quantities.

Q. Well, at that point I would like to inquire of you as to whether they are able to obtain small orders at as low rates as large ones?—A. No; I do not think it is possible.

UNCERTAINTY OF DEMAND INCREASING THE PRICE OF BEEF.

Q. It was stated by some that contractors take more than they need. How is that?—A. Generally a large margin is allowed to a contractor, for they do not know how many men will be retained at a post, and the contractor may be called upon to deliver a large order at short notice.

Q. Does not that operate against a low bid?—A. Yes; that operates against the Army bids. That is one reason why the price of beef for the Army is higher than that bid for the Indian Department.

Q. But if the Army had the management of the contracts in place of the Interior Department, do I understand you that they could purchase beef more economically than it is now done?—A. I think equally as economically—I do not say cheaper; they would buy in larger quantities. They would advertise in the same way. There is one thing that is generally understood by cattle-men in Texas, and that is that the beef-contractors for the Army buy the choicest cattle, and the beef-contractors for the Indians the cheapest.

Q. You mean the Interior Department?—A. Yes, sir. The Army requires a better article than the Indians, they consider.

Q. You say you have had no knowledge within the last few years as to the requirements of the contracts of the two departments?—A. My knowledge is confined mainly to 1869 and 1870.

DIVIDED AUTHORITY TO BE AVOIDED.

Q. Well, you say that it would be better for the Indians, in your opinion, to be transferred to the military department of the government; in what particular do you mean?—A. Well, my opinion has been this: as it now stands, it is a very divided authority. There are two bosses, you might say—the Indian Department and War Department—which often creates confusion; and as it is impossible to get along without the aid of the Army to control the Indians, my opinion is that it would be better to turn them over to the Army exclusively, to say nothing of the saving that would be effected by doing away with a large number of officials and employés in the Indian Department.

Q. Does your opinion on this point have reference also to the Indians that are considered civilized or semi-civilized, and are mainly taking care of themselves; do you think that they ought also to be put into the hands of the Army?—A. Do you mean the Cherokees, Choctaws, &c.?

Q. Yes, sir.—A. I consider that they are competent to get along themselves pretty well.

Q. Well, there are others besides those, who are trained in agricul-

tural pursuits. You heard the testimony of Mr. Janney as to their raising wheat, corn, &c., and the testimony before us was that they are living in houses, very many of them; what would you think of that class of Indians being placed under the control of the Army?—A. I do not see why the Army could not manage them just as well.

Q. Well, do they really require any management except to pay them what we owe them under the treaties?—A. Well, that is one very important matter that the government has not been very punctual in, the payment to the Indians as they ought to have been paid under the treaty stipulations.

Q. Has not that been one main cause of the difficulties we have had with the Indians?—A. I have always understood so—one of the difficulties.

By Mr. HOOKER:

Q. Mr. Giddings, you say that your residence is in Texas?—A. Yes, sir; since 1846.

Q. A large portion of the cattle for the beef supply of the Army and of the Indians is from your country, I believe?—A. Yes, sir.

Q. In what direction are the cattle driven?—A. Hundreds of thousands of head are driven north.

Q. You say it is generally understood by cattle-raisers in your country that the Army contractors require a better quality of beef than the Indian contractors?—A. Yes, sir; that is the impression among cattlemen.

Q. These contracts you speak of that were made at the large lettings in Chicago, four or five years ago, or longer, at what rate did the Indian contractors agree to furnish it?—A. I think it was a fraction over two cents a pound.

Q. What became of those contractors?—A. I understood afterwards that they failed, and did not carry out the contract; and that it cost the government more than my bid. That is my understanding of it.

Q. Whom were you representing on that occasion?—A. I was representing large raisers of cattle in Texas.

Q. And you did not get the contract because they underbid you?—A. I bid, I think, a little over four cents. It was a letting to supply all the Indian posts with beef, and as a portion of these were the large posts on the North Missouri, it required a very large number of cattle.

Q. What was the lowest bid on that occasion?—A. If I remember, it was two and a quarter or two and three-quarter cents; it was under three cents.

Q. Could not beef of good quality have been supplied at that time at that rate?—A. I do not think that it could. My bid, which was the lowest we could supply at, was a trifle over four cents.

Q. What was your knowledge of the character of the beef supplied to the Army? I mean as to weight, in net or gross, and as to the character of the beeves, whether there should be any stags, or cows, or cows with calves, or otherwise inferior in the estimation of cattle-men. What was the difference in the character of the beef furnished to the Army and of that furnished to the Indians?—A. Well, sir, my understanding was that the Army required first-class beef in the markets wherever they advertised. No stags; everything had to be first-class, and delivered by weight, in such quantities as required, from the block.

Q. What was the character of the beef furnished under the Indian contracts?—A. My experience, so far as it has gone, is that they bought everything they could get, pretty much, and delivered it in bulk in large quantities, and estimated it instead of weighing it. I believe that one

year, when General Harney had charge, they required it to be weighed alive.

Q. On foot?—A. Yes, sir.

Q. And the beef to the Indians is usually furnished in that way?—A. That is the way it used to be done. Of late years I have not kept posted.

Q. What becomes of the cattle that are unable to stand the drive—the stags, calves, &c.—how are they disposed of?—A. It is rumored that Indian contractors have agents on the drives to pick up all the cattle that break down; that is the rumor.

Q. You do know, as a fact, that among beef-suppliers it is understood that a different order of beef is required for the use of the Army from that required for the use of the Indians?—A. Yes, sir; that is the impression. I have heard them repeatedly express it.

Q. The quantity to be supplied under the Army regulations varies according to the number of men at the post, which can be increased or diminished by order of the Secretary of War?—A. Yes, sir; and the contractor is required to furnish beef generally three times a week, fresh.

Q. What is the requirement of the Army as to the weight of the beef?—A. They almost always state that in the advertisement. The last I recollect was a thousand pounds gross. I have been told, however, that some of our posts lately have accepted as low as eight hundred and fifty or nine hundred pounds.

Q. But they require them to be of that weight, and not less?—A. That is generally specified in the proposals; it was the case when I used to bid for them.

Q. You do not, then, see any reason why the Army could not supply beef as cheaply, in as large quantities, as the Interior Department?—A. I see no reason whatever.

Q. You do not claim that they could do it for less?—A. I do not claim that they can.

By Mr. STEWART:

Q. You say that it was in 1869 and 1870 that you were engaged in contractor's business, and attended the lettings in Chicago?—A. I may be mistaken; it may have been 1871. They were very large lettings in Chicago.

Q. But do you not know that at that time these posts and agencies were under the jurisdiction of Army officers detailed in accordance with President Grant's policy at that time?—A. I think, sir, there were Army officers acting as agents at that time, but I do not think exclusively Army officers; I understood he was appointing agents from religious denominations.

Mr. STEWART. Not at that time, I think.

Mr. BOONE. The "peace policy" was inaugurated in 1868.

By Mr. STEWART:

Q. Then you think that these parties who put in bids intended to cheat the government?—A. I thought so at the time; I think so still.

Q. Well, is it not the fact that all the cattle supplied now for the Indian department are obliged to be weighed?—A. That I cannot say; I have not put in bids of late years.

Q. Not for the Army?—A. Not of late years for the Army.

Mr. STEWART. That is all.

On motion of Mr. Boone the taking of evidence was closed, and the committee adjourned to meet at the call of the chairman.

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45TH CONGRESS, 3d Session. } SENATE. { MIS. DOC. No. 59.

ANNUAL REPORT

OF THE

BOARD OF REGENTS

OF THE

SMITHSONIAN INSTITUTION,

SHOWING THE

OPERATIONS, EXPENDITURES, AND CONDITION OF THE INSTITUTION FOR THE YEAR

1878.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1879.

FORTY-FIFTH CONGRESS—THIRD SESSION.

IN THE SENATE OF THE UNITED STATES,

March 3, 1879.

The following resolution was agreed to by the Senate February 10, 1879, and concurred in by the House of Representatives March 3, 1879:

Resolved by the Senate (*the House of Representatives concurring*), That 10,500 copies of the Report of the Smithsonian Institution for the year 1878 be printed, 1,000 copies of which shall be for the use of the Senate, 3,000 copies of which shall be for the use of the House of Representatives, and 6,500 for the use of the Smithsonian Institution.

Attest:

GEO. C. GORHAM,

Secretary.

LETTER

FROM THE

SECRETARY OF THE SMITHSONIAN INSTITUTION,

TRANSMITTING

The annual report of the Institution for the year 1878.

FEBRUARY 8, 1879.—Ordered to be printed.

SMITHSONIAN INSTITUTION,
February 7, 1879.

SIR: In behalf of the Board of Regents, I have the honor to submit to the Congress of the United States the annual report of the operations, expenditures, and condition of the Smithsonian Institution for the year 1878.

I have the honor to be, your obedient servant,

SPENCER F. BAIRD,
Secretary Smithsonian Institution.

Hon. W. A. WHEELER,
President of the Senate.

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION FOR 1878.

This document contains:

1. The annual report of the Secretary, giving an account of the operations and condition of the establishment for the year 1878, with the statistics of collections, exchanges, &c.

2. The report of the Executive Committee, exhibiting the financial affairs of the Institution, including a statement of the Smithson fund, the receipts and expenditures for the year 1878, and the estimates for 1879.

3. The proceedings of the Board of Regents for the sessions of May, 1878, and January, 1879.

4. A general appendix, including translations from foreign journals or works not generally accessible, but of interest to the collaborators and correspondents of the Institution, teachers, and others interested in the promotion of knowledge.

THE SMITHSONIAN INSTITUTION.

RUTHERFORD B. HAYES, President of the United States, *ex officio* Presiding Officer.
MORRISON R. WAITE, Chief Justice of the United States, Chancellor of the Institution (President of the Board of Regents).
SPENCER F. BAIRD, Secretary (Director of the Institution).
WILLIAM J. RHEES, Chief Clerk.

REGENTS OF THE INSTITUTION.

MORRISON R. WAITE, Chief Justice of the United States.
WILLIAM A. WHEELER, Vice-President of the United States.
HANNIBAL HAMLIN, member of the Senate of the United States.
AARON A. SARGENT, member of the Senate of the United States.
ROBERT E. WITHERS, member of the Senate of the United States.
HIESTER CLYMER, member of the House of Representatives.
ALEXANDER H. STEPHENS, member of the House of Representatives.
JAMES A. GARFIELD, member of the House of Representatives.
JOHN MACLEAN, citizen of New Jersey.
PETER PARKER, citizen of Washington, D. C.
ASA GRAY, citizen of Massachusetts.
HENRY COPPÉE, citizen of Pennsylvania.
WILLIAM T. SHERMAN, citizen of Washington, D. C.
NOAH PORTER, citizen of Connecticut.

EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS.

PETER PARKER. JOHN MACLEAN. WILLIAM T. SHERMAN.

MEMBERS EX-OFFICIO OF THE INSTITUTION.

RUTHERFORD B. HAYES, President of the United States.
WILLIAM A. WHEELER, Vice-President of the United States.
MORRISON R. WAITE, Chief Justice of the United States.
WILLIAM M. EVARTS, Secretary of State.
JOHN SHERMAN, Secretary of the Treasury.
GEORGE W. McCRARY, Secretary of War.
RICHARD W. THOMPSON, Secretary of the Navy.
DAVID M. KEY, Postmaster-General.
CARL SCHURZ, Secretary of the Interior.
CHARLES DEVENS, Attorney-General.
H. E. PAINE, Commissioner of Patents.

OFFICERS AND ASSISTANTS OF THE SMITHSONIAN INSTITUTION AND NATIONAL MUSEUM, JANUARY, 1879.

SPENCER F. BAIRD,
Secretary, Director of the Institution.
WILLIAM J. RHEES,
Chief Clerk.
DANIEL LEECH,
Clerk, Correspondence.
CLARENCE B. YOUNG,
Clerk, Accounts.
HERMANN DIEBITSCH,
Clerk, Foreign Exchanges.
JANE A. TURNER,
Clerk, Library.
MAGGIE E. GRIFFIN,
Clerk, Distribution of Publications.
SOLOMON G. BROWN,
Clerk, Transportation.

G. BROWN GOODE,
Curator of the Museum.
F. M. ENDLICH,
Assistant, Mineralogy.
ROBT. RIDGWAY,
Assistant, Ornithology.
TARLETON H. BEAN,
Assistant, Ichthyology.
CHAS. RAU,
Assistant, Archæology.
EDWARD FOREMAN,
Assistant, Ethnology.
F. H. CUSHING,
Assistant, Ethnology.

JOSEPH PALMER,
Taxidermist.
T. W. SMILLIE,
Photographer.
JOSEPH HERRON,
Janitor.

REPORT OF PROFESSOR BAIRD,

SECRETARY OF THE SMITHSONIAN INSTITUTION, FOR 1878.

To the Board of Regents of the Smithsonian Institution:

GENTLEMEN: I have the honor herewith to present the report of the operations and condition of the Smithsonian Institution for the year 1878.

The most important event during that time, and, indeed, in the history of the establishment, is the death of Professor Henry, its lamented Secretary, to whom was intrusted its organization in 1846, and under whose firm and judicious direction it has been carried safely forward, surmounting in its progress many obstacles and trials, to its present condition of efficiency and prosperity.

It is difficult to overestimate the importance to science and humanity of the administration of Professor Henry in this connection. It was a mere chance that the right man for the place would be selected, and whether any other of the candidates would have done equally well it is, of course, impossible to say. It is very certain, however, that the chances would have been adverse to such a result. The most logical methods of operation and research, the strictest economy of administration, the restriction of the Institution to its legitimate functions in the increase and diffusion of knowledge among men, and the avoidance of all entangling alliances of every kind, signally characterized the administration of affairs by Professor Henry for the long period of nearly one third of a century. This time sufficed to impress upon the Institution a definite policy, and one which will, I trust, be permanent. It will certainly be my endeavor, as the successor of Professor Henry, to carry out his principles during whatever period Providence and your good-will may grant me the direction of affairs.

The characteristics of the policy adopted by Professor Henry at the beginning of his administration, and sanctioned by the Board of Regents, were, first, never to attempt to do with the funds and appliances of the Institution what could equally well be done by other appropriate agencies; secondly, to attempt nothing which might not strictly be considered as coming within the department of science, theoretical or applied; thirdly, to keep all expenditures within the income of the Institution, and never to allow the operations of one year to be hampered by indebtedness carried over from the preceding; and, finally, not to restrict the operations of the institution to Washington, or even to the United States; but to extend its benefits to the whole world, in view of the proper inter-

pretation of the will of Mr. Smithson that the main functions of the institution should be "the increase and diffusion of knowledge among men."

Numerous illustrations of the policy of Professor Henry in regard to the first principle adopted by him can be adduced. No matter how favorite the branch of research might have been with him, nor what amount of reputation might be gained to the Institution by prosecuting it, he was always ready to transfer it to those who could carry it on with success. The most noteworthy instance, perhaps, was that in connection with the subject of meteorology, which had from the beginning been one of special interest to him. The very earliest action in the scientific direction of the Institution had reference to the adoption of a general system of meteorological observations throughout the United States and the adjacent portions of America, and the proper reduction of the results in a systematic form. Up to the time of the establishment of the Signal Office, this was by far the most important feature of Smithsonian activity. It embraced a connection with about six hundred observers from all the walks of life and in all parts of the country. With these, constant communication was held, and from them were received monthly detailed observations of various degrees of minuteness and accuracy on blanks furnished to them previously by the Institution; and an extended correspondence was maintained with them, not only on meteorological subjects but upon others of scientific interest. For more than twenty-five years this relation continued with the most important results, the work extending and enlarging year by year in a rapid ratio.

As soon as the operations of the United States Signal Office were established by government, under General Myer, Professor Henry offered to turn over the Smithsonian system with its observers to that establishment, and this offer being accepted the transfer was made; since then the Institution has confined itself to working up the results of a quarter of a century's labors and publishing them in a systematic and digested form. The series of such digests has been nearly completed and the whole will be finished as rapidly as the funds of the Institution will permit.

It was to this restriction of effort to subjects of importance, in a scientific or practical point of view, which were not otherwise provided for, that is due the impression made upon the progress of learning by the Smithsonian Institution as administered by Professor Henry. There are numerous establishments in the United States, not of precisely similar character, but with the same general object, and with equal or larger funds of endowment, but which are scarcely known or even heard of outside of the limits of the city in which they may happen to be situated. The name of the Smithsonian Institution, on the contrary, is a familiar one in every part of the world; and it may almost be said that it is even better understood, comprehended, and appreciated in the remotest parts of Europe than it is in some sections of the United States.

At the beginning of the active operations of the institution, Professor Henry prepared what he called a "Programme of organization." This was first submitted to the judgment of leading men of science throughout the United States and Europe, and received general approval. It was presented to the Board, and adopted as the basis of future operations. It is interesting to note that whatever new lines of research or of practical work have been taken up from time to time by the Institution, were simply the carrying out into practical effect of one or other of the subdivisions of the proposed programme.

The board at its special meeting, held on the 17th of May, 1878, directed the preparation of a suitable biography of its late Secretary, and also the holding of a memorial service in one of the halls of Congress, if it could be obtained for the purpose. The preparation of this biography was intrusted to a committee, consisting of President Porter, of Yale College, Dr. Maclean, of Princeton, and Professor Gray, of Harvard; and it has been prepared by the latter gentleman, and will be submitted by him to the Board.

The arrangements for the memorial services have been made, to take place on the evening of Thursday, January 16, 1879. In addition to the records prepared by the direction of the Board, two other memoirs have been written, and were presented, October 26, 1878, to the Philosophical Society of Washington, of which Professor Henry had been the presiding officer from the time of its organization. One of these memoirs, by Dr. Welling, president of Columbian University, gave an account of Professor Henry's life and character with reference to his personal, social, and educational qualities; and the other, by Mr. William B. Taylor, set forth more particularly his scientific work and the succession of his discoveries.

Professor Henry's last illness dates from the autumn of the year 1877, and was apparently induced in a considerable measure by exposure while carrying on a series of experiments in behalf of the Light-House Board. After his return from Staten Island, he was able to bestow but little attention to the details of the work of the Institution; although, up to the very day of his death, he was directing and controlling it as from the beginning. Shortly after his return in the autumn, he made a visit to Philadelphia, for the purpose of being under the care of Dr. S. Weir Mitchell, and came back to Washington after an absence of a few weeks. His death took place on the 13th of May, 1878,—a peaceful and happy death—surrounded by his family and friends.

After his decease, as in his life, he was signally honored. Congress adjourned to attend the funeral, which was also marked by the presence of the highest dignitaries of the country, including the President and his cabinet, the justices of the Supreme Court of the United States, and those of the District of Columbia, the diplomatic corps, and numerous organizations of which he was a member, as well as others from abroad.

Honored by the Board in being selected to succeed Professor Henry, it was with the greatest diffidence, and with an unaffected distrust in my ability to administer worthily the operations of the Institution, that I accepted the trust. Animated by a desire to secure the continuance of the wise policy inaugurated and maintained by Professor Henry,—by a consciousness of familiarity with the varied duties required,—and by a natural sympathy of purpose resulting from a long association with him—holding steadily before me his example—I venture upon the experiment; hoping only that the contrast of the present administration of the Institution with that of the past will not be too unfavorably marked.

I may, perhaps, be pardoned for calling attention to the fact that my own connection with the Institution and association with Professor Henry dates back to the year 1850, and that consequently, for more than twenty-eight years, I have been engaged in carrying out the principles established by the late Secretary, and that the details of administration, and the general plans of operation, are consequently not unfamiliar to me. My association has indeed been, indirectly, longer than the time mentioned, since as early as 1848 I visited Professor Henry and was engaged by him to carry out certain researches in reference to the natural history of Pennsylvania, aided by a grant of money from the funds of the Institution, for the purpose.

Although the fact of the death of Professor Henry was promptly spread over the United States and transmitted throughout the Old World by means of the telegraph, it was thought proper, in accordance with the usage of similar establishments, to make a formal announcement by a circular letter, addressed to the foreign correspondents of the Institution. A circular was accordingly prepared in the name of the Chancellor and widely distributed. This has elicited a great number of responses, containing gratifying expressions of condolence and sympathy.

The regular session of the Board of Regents for the winter of 1877 was held in January, 1878, at which time the report for 1877 was presented by Professor Henry and approved. An extra meeting was called on the 17th of May, on the day after Professor Henry's funeral, at which an election of his successor took place, and arrangements were made for a proper eulogy and the memorial meeting in January, 1879.

The law of Congress establishing and organizing the Smithsonian Institution makes no provision for the discharge of the duties of the chief officer by any person other than the Secretary; and as no bills for services, for salaries, labor, supplies, &c., can be paid without his indorsement, the disability or death of the Secretary during the recess of the meetings of the Board is likely to involve very serious difficulties. For the purpose of providing for this contingency, Senator Hamlin, a Regent of the Institution, has introduced a joint resolution into the Senate, providing that in case of the death, disability, or absence of the Secretary, the Chancellor be empowered to appoint some one to discharge

his duties until any necessary provision can be made by the Board in full session, it not being expected that the Board could be brought together outside of the period of the meeting of Congress. This resolution has already passed the Senate, and it is hoped will soon pass the House and become a law.

The only change in the Board of Regents to be placed on record is the resignation of Mr. Bancroft and the election of General Sherman, a former Regent, to fill his place. General Sherman was also elected by the Board at its special meeting of the 17th of May to serve as one of the Executive Committee.

The continued expansion of the operations of the Institution, especially those connected with its department of international exchanges, has called for accommodations more extended than those that have been available; and Professor Henry, for some time before his death, had in contemplation a removal from that portion of the building occupied by his family, to a private residence in the city. He was considering this question more urgently when his illness supervened, and of course interrupted any further action on his part.

Although the occupation of the east wing of the building free of rent was one of the privileges of the Secretary of the Institution, I found that all the rooms in the building could be used to great advantage as offices of the Institution; and I therefore determined, with the consent of the members of the Executive Committee, to devote them to that purpose. A door was opened in the wall separating the present rooms from the apartments adjacent to them, and some other trifling inexpensive alterations were made, by which the entire house was transformed into a series of offices and work-rooms. Every room is now in use, and the entire force of clerks and employés has been concentrated in the east range and wing, so that they are closely connected in their work, adding very greatly to the efficiency of operations.

A system of electric bells and telephones has been established throughout the building, by means of which instant communication can be had between the several offices and work-rooms without involving the loss of time required to pass from one to another, or without calling any one from his work.

FINANCES.

In the report of the Executive Committee will be found a detailed statement of the finances of the Institution, which are believed to be in a satisfactory state. The amount to the credit of the late Secretary at the time of his death was $8,522.98. This was transferred on the 28th of May, 1878, to the credit of his successor, with whom a new account was opened at the Treasury. The premium on the gold-bearing interest of the Smithsonian endowment, which has heretofore constituted a more or less prominent item of the receipts for the year, has, of course, disappeared; only a small percentage having been realized on the July payment. As the natural counterpart to this, however, the reduction in

the price of labor and the decrease in the cost of many articles of general supply leaves the Institution in a correspondingly better financial condition than before.

The following is a statement of the condition of the Smithson fund at the beginning of the year 1879:

The amount originally received as the bequest of James Smithson, of England, deposited in the Treasury of the United States in accordance with the act of Congress of August 10, 1846	$515,169 00
The residuary legacy of Smithson, received in 1865, deposited in the Treasury of the United States in accordance with the act of Congress of February 8, 1867	26,210 63
Total bequest of Smithson	541,379 63
Amount deposited in the Treasury of the United States, as authorized by act of Congress of February 8, 1867, derived from savings of income and increase in value of investments	108,620 37
Amount received as the bequest of James Hamilton, of Carlisle, Pa., February 24, 1874	1,000 00
Total permanent Smithson fund in the Treasury of the United States, bearing interest at 6 per cent., payable semi-annually in gold	651,000 00
In addition to the above, there remains of the extra fund from savings, &c., in Virginia bonds and certificates, viz: Consolidated bonds, $58,700; deferred certificates, $29,375.07; fractional certificate, $50.13; total, $88,125.20, valued January, 1879, at	34,000 00
Cash balance in United States Treasury at the beginning of the year 1879, for current expenses	19,632 57
Total Smithson funds January 8, 1879	704,632 57

BUILDING.

Some damage was done to the Smithsonian building by the severe storms of the summer of 1878, and considerable expense incurred in repairs. The finial on the west tower was blown off and a large number of slates torn away, all of which required reconstruction. The occasion was taken to give the gutters, spouts, and lightning-rods a thorough overhauling, leaving everything, it is believed, in the best condition. The basement has been cleaned and whitewashed, and all unserviceable material, including scrap-iron, &c., has been suitably disposed of.

PUBLICATIONS.

As has been frequently stated in former reports, the publications of the Institution consist of three classes: The first, the "Smithsonian Contributions to Knowledge"; the second, the "Smithsonian Miscellaneous

Collections"; and the third, the "Annual Reports of the Regents" of the Institution. The works of the first class, the Smithsonian Contributions to Knowledge, are published in quarto form, and are intended to embrace original memoirs, either the result of special investigations authorized and directed by the Institution, or prosecuted under other auspices and presented to it. The works of the second class, the Miscellaneous Collections, are similar in plan and construction to the "Contributions," but are in octavo form, and embrace more particularly monographic and descriptive papers in natural history, formal or systematic lists of species of animals or plants, physical tables, reports on the present state of knowledge in some department of physical or biologic science, &c. As with the "Contributions," each volume is composed of several distinct and independent papers, having no necessary connection with each other, the collection being determined chiefly by the aggregate number of pages suitable for a volume of average size. The average number of pages in the quarto volume is about 600; in the octavo volume, about 800. Each paper or memoir in either class is separately paged and indexed, with its own title-page, so as to be complete in itself, and separately distributed according to its subject. Of the quarto "Contributions," twenty-one volumes, and of the "Collections," fifteen volumes have been published.

The Smithsonian annual reports commenced in 1847, and being made to Congress, are published by that authority, and not at the expense of the Smithson fund. The earlier reports of the Secretary were printed in small pamphlet editions, but were collected and reprinted with the report for 1853, and with this the series of bound volumes may be said to have begun. The number, or edition, ordered by Congress has varied from year to year, but the proportion of copies placed at the disposal of the Institution has been distributed to its correspondents as fully and liberally as possible.

Smithsonian Contributions to Knowledge published in 1878.—For several years past the Institution has had in its archives a paper by the late Prof. Henry J. Clark, relating to the Lucernariæ, an extremely interesting group of marine animals closely allied to the *Acalephs*, or Jelly-fish. The death of the author before the work could go to press, and the difficulty of finding any one willing to undertake the editing of it, prevented immediate action on the memoir; but Prof. A. E. Verrill having agreed to take charge of the work, it was at length put to press, and was finally published in 1878. The memoir consists of 138 quarto pages and eleven plates, and it has been distributed to the leading zoologists. The Institution is under great obligations to Professor Verrill for the careful and critical supervision of the typographical execution of the work, as well as for some important notes and rectifications. Mr. Samuel F. Clark, of Johns Hopkins University, is also entitled to the thanks of the Institution for assistance in revising proofs during the period when Professor Verrill was ill.

The second quarto memoir, published in 1878, is a paper by Mr. William H. Dall, "On the Remains of later Prehistoric Man, obtained from caves in the Catherina Archipelago, Alaska Territory, and especially from the caves of the Aleutian Islands." In the Secretary's report for 1875 (page 48) will be found a brief notice of some interesting mummified human remains from the Aleutian Islands presented by the Alaska Commercial Company. These comprised a series of nine mummies from Kagaymil Island and one from Prince William's Sound. Mr. Dall's memoir on the subject has been printed, containing the result of a careful examination of these remains and the relics found with them, an account of the tradition and history relating to them, and such explanations of the manufacture, character, and use of the various associated articles as the author's observations during eight years in that region enabled him to furnish. Ten heliotype illustrations accompany the memoir, which, though inferior to finely engraved views in an artistic point of view, offer a style better suited to convey a correct idea of the complicated details represented than any other mode of illustration at present in use.

Two remaining quarto papers now in press will be published early in the year 1879. The first of these is the memoir of Dr. S. Habel, describing "The Sculptures of Santa Lucia Cosumalwhuapa, in Guatemala." As this interesting work was quite fully described in the Secretary's last Report (for 1877, pages 13 to 16), it is unnecessary here to particularize it further.

The other paper referred to (constituting the fourth of the above-mentioned series) is "A Classification and Synopsis of the Trochilidæ," by Mr. D. G. Elliot. The beautiful and brilliant-colored "metallic" plumage of the humming-birds in many instances assumes, among individuals of the same species, widely-contrasted hues, rendering the correct identification of the species by the naturalist only possible through a considerable experience or the opportunity of examining a large series of specimens. Within the past ten years a large number of new species have been discovered in this group, supplying important links between previously-known species that could not have been heretofore harmoniously ranged in the family. The vast collection which has produced the material for this work contains many types and specimens of great rarity, obtained from such well-known trochilidists as Bourcier, Gould, Verreaux, &c. Of the 426 species acknowledged in the work as worthy of such rank, 380 are contained in the author's collection, represented by about 1,800 specimens. A novel feature of the work is the engraving that accompanies the diagnosis of each genus, illustrating the characteristics by which any specimen may be readily referred to its proper genus. The characters recognized as most important for determining a system of classification are taken from the male bird alone, it being found impossible to harmonize in so large a group any that should be selected from the two sexes indiscriminately. The present synopsis

will be useful both to the student and to the naturalist by enabling them to easily identify their specimens, and will assist them to a natural classification of the family.

Miscellaneous Collections published in 1878.—Among the "Collections" published in the past year have been several very important circulars intended to facilitate the collection of material for scientific research. The first of these, prepared by Prof. O. T. Mason, at the request of the Institution, relates to the various remains of American archæology scattered throughout different parts of our continent, consisting of mounds, earthworks, ditches, graves, &c. A vast amount of isolated and disconnected research has been directed toward these objects, in most cases by persons ignorant of the true method of examination or of the precise nature of the problems to be solved in connection with them. The circular referred to comprises 15 pages, indicating the features of special interest, a record of which it is desired to possess, and giving a table of symbols to be used to secure uniformity of illustration and facility of reference. It also invites contributions of notes, surveys, maps, illustrations, &c., of the objects, and also requests the contribution of such specimens as may be found in the localities described, including stone implements, pottery, bone tools, &c. Of this circular many thousand copies have been distributed, and these have elicited a vast amount of material. This is all carefully and systematically classified and arranged, and as soon as it appears to be measurably complete it will be placed in the hands of one or more specialists, by the aid of whom it is hoped the Institution may be able to prepare an exhaustive treatise on the subject which will mark as important a stage of progress in the history of American archæology as was done by its publication, in 1849, of Squier & Davis's work upon the ancient mounds of the Mississippi Valley.

The second circular published was one prepared by P. R. Uhler, of Baltimore, in reference to the collection of specimens of *craw-fishes.* This group of fresh-water crustaceans, which is found in most parts of the world, with some curious exceptions, furnishes an interesting field for inquiry into the modifications produced in animal forms by certain physical or other conditions, Professor Huxley, among others, having lately prepared an elaborate paper upon the subject. In previous years quite a number of new craw-fishes were described from the collections of the National Museum, by Mr. Charles Girard. The group was afterwards made the subject of a very comprehensive investigation by Dr. H. Hagen, of Cambridge. It is, however, thought that there is room for still further inquiry, and the material in possession of the Smithsonian Institution will be placed in the hands of competent specialists for investigation. In the circular an illustration of the craw-fish is given, for which the Institution is indebted to Messrs. Appleton & Co., New York.

The third circular, to form part of a forthcoming volume of Smithsonian Miscellaneous Collections, is in reference to the living *reptiles* of

North America. The United States Fish Commission, under the auspices of the Smithsonian Institution, exhibited at the Philadelphia Centennial of 1876 an extremely interesting series of plaster and papier maché casts of fishes, cetaceans, and some reptiles, all carefully colored from nature, and representing a much larger number of such objects than had ever been brought together under one roof. Since that time the artists connected with the National Museum have been diligently engaged in extending and improving the series, and for nearly two years past their efforts have been conducted especially in the line of the reptiles. The circular in question was intended to indicate precisely the forms or species desired, and it has been extensively distributed. As the result, the Institution was the recipient, in 1878, of very large numbers of living turtles, serpents, lizards, salamanders, &c., the greater portion of which has been carefully molded and reproduced in artistic style. It is believed that no museum extant can show such a series of serpents, in their natural attitudes, as is now on exhibition in the National Museum.

Another publication of 1878 is a new "List of Foreign Correspondents." The rapid increase in the number of scientific establishments in relationship with the Institution requires a new edition of this list every few years; and although the present one is much more extensive than that published in 1872 (containing 2333 numbers of titles as compared with 1919), even now arrangements are being made by the Institution for a still more complete and exhaustive edition. With this view a circular has been sent to all the names upon the present list, asking for rectifications or typographic corrections, and the addition of any addresses of public libraries, learned societies, or scientific bureaus of governments not already included. The Institution also requested secretaries of societies to furnish a list of the names and addresses of persons actively engaged in scientific or literary investigations in their respective towns, together with the particular branches of learning to which each was devoted, with the view of facilitating communication and exchanges with *specialists* in all parts of the world. The responses to these requests are coming in rapidly; and when all are received, a suitable arrangement and publication of the material will be made.

Twenty years ago (in 1858), the Institution published a list of the *Diptera* (flies, musquitoes, &c.) of North America, by Baron R. Osten-Sacken, at that time attached to the Russian Legation at Washington. The author, although especially a student of the order of diptera, was interested in other groups, and coming to the United States at a time when our entomologists were few and widely scattered, he devoted a considerable part of his leisure to travel over the country, making the personal acquaintance of most of those interested in this branch of natural history. In that connection he rendered a valuable aid to the extension of American entomologic science, which is entitled to public recognition. Through his efforts numerous entomologists, situated far

apart, and prosecuting studies of a similar character, without the knowledge of other labors than their own, were brought into relations of correspondence and exchange, and thus, by their mutual sympathy and support, and by the concentration of effort on the part of each to some special line of research, the common interest of science was advanced. We regret to say that after many years sojourn in this country, Baron Osten-Sacken has returned to Europe, where, however, his assistance is continually invoked by entomologists desiring information in regard to type specimens, books not procurable in the United States, &c.

The list of *Diptera* aforesaid (published in the Miscellaneous Collections) brought together a mass of references to the descriptions of about 1,800 species, scattered in more than one hundred different works and scientific papers. Such a publication was an indispensable preliminary step before any study of the diptera could be attempted. This formed the first of a series of works undertaken by the Institution to facilitate the study of entomology, which has included diptera, coleoptera, lepidoptera, neuroptera, and hymenoptera.

During the past year the work of Baron Osten-Sacken, much extended by his later critical studies, has been republished by the Institution. This new edition of the work is not merely a revision of the catalogue published twenty years ago; but it is an entirely new one prepared on a different plan. The difference between *eleven* and *sixty-six*, the number of species of one genus, *Trypeta*, represents the addition made to our knowledge during the interval between the two catalogues. Other genera give similar results. Another important difference between the old and new catalogues consists in the fact that the majority of the species enumerated in the latter are represented in a collection now in the Museum of Comparative Zoology in Cambridge, Mass., which contains over 2,000 named and described species of diptera from North America. The region embraced in the present catalogue is the whole of North America, including the West Indies. It has been the effort of the author to make sure that every name in the list should actually represent a different species. To attain this result, he visited and examined the museums in London, Paris, Lille, Berlin, Frankfort, Darmstadt, Turin, and Vienna. Of all orders of insects the diptera offer probably the most difficulties to the describer, arising from the minuteness of the characters on which generic and specific distinction are based. Each family requires a special study, and a dipterologist may be very well versed in some families, without being able to express any opinion with regard to questions concerning others. In the introduction to the catalogue, the author presents some recommendations as to the best course to be pursued in the study of diptera, and advises *specialization*. Amateurs may collect and name specimens, but should not publish anything until they have chosen some single family and nearly exhausted it by study and collecting. "The exhaustive study of a single family is far more remunerative both in pleasure and in usefulness

than the random description of numerous new species." The catalogue forms an octavo volume of 324 pages, and includes a full index.

Another paper published in 1878, to be mentioned, is a "Botanical Index," prepared by Prof. Sereno Watson, of Cambridge, Mass. The purpose of this index is to furnish references to whatever has been published respecting the plants of North America, under their Linnean specific names, in works or papers that may be classed as belonging to systematic botany. For the region west of the Mississippi and for British America, the literature of which is almost wholly fragmentary and greatly scattered, and on account of which especially the work was originally begun, it is intended to be complete. And it is essentially so also for the eastern flora, where, however, there is not the same necessity that the citations should be exhaustive. To avoid the perpetuation of errors it was desirable to eliminate false species and to correct wrong determinations wherever they had gone upon record. This could not have been thoroughly done without a complete revision of the flora itself, which was of course out of the question; nevertheless it was rendered to a considerable extent possible as respects the western flora, by the author's connection with the "Botany of California"; and in many other cases he was enabled to decide upon the validity of species, and to verify determinations or to settle doubtful synonymy by comparisons of specimens themselves in the collection of the Harvard Herbarium.

The delays that have arisen in the preparation of the volume have not been without compensation in the far more complete and satisfactory results which were only thus made possible; and the deficiencies of the earlier portions are largely supplied by the copious appendix, which makes the whole essentially complete, up to the date of publication. The portion now printed covers the ground of Torrey and Gray's Flora of North America, which was published in 1838–1840, and is now so completely out of date as to leave this portion of our botany nearly as much in need of revision as any other. Until such revision can be made (and it must still be delayed some years), the "Index" will necessarily be a partial substitute—in some respects sufficient, inasmuch as it shows what genera and species are recognized as forming our flora, and also as concerns the synonymy, which could not be given with any such completeness, within the limits of the desired revision, and moreover sufficient in its references to all existing descriptions of those species. In any given case, these descriptions may indeed be practically inaccessible, or they may be incomplete or faulty, and it is herein that nothing can be a substitute for a "Flora," which shall bring together into one volume perfected descriptions, together with such grouping of genera and species as to indicate their natural affinities. For the preparation of such a Flora, or for the study of any special portion ot the field, the present Index will meantime be an important aid, giving as it were a skeletonized history of each individual species, and affording a clue to all that is known toward the needed filling out of the outline. The

total number of orders given in the Index is 69; of genera, 545; of species, 3,038. The work forms an octavo volume of 484 pages.

A work too long delayed, and constituting a most important addition to the Miscellaneous Collections—a memoir of the founder, James Smithson, with a collection of his published contributions to science, followed by a documentary history of the organization, rise, and progress of the Institution—has during the past year been collected and prepared, and is now in press.

At a meeting of the Board of Regents, held January 23, 1878, it was resolved that the Secretary be requested to have a memoir of James Smithson prepared and published, to include all his scientific papers now accessible; and that the Secretary prepare and publish a history of the origin and progress of the Institution. In accordance with these resolutions, the Secretary directed Mr. William J. Rhees, the chief clerk, who had been connected with the Institution for more than twenty-five years, to commence the collection of material for these works, and on the death of Professor Henry, Mr. Rhees was requested to continue his labors. No compilation of this character having been previously attempted, the investigation involved a laborious research.

The scientific papers of Smithson, which originally appeared in the Philosophical Transactions of the Royal Society of London, and in Thomson's Annals of Philosophy, have been collected and reprinted; they occupy 120 octavo pages. These memoirs were submitted to several chemists and mineralogists for an estimate of the scientific value of Smithson's researches, and the present acceptance or recognition of the results obtained by him.

The history of the Institution contains the will of Smithson, the manner in which the bequest was obtained by the United States, the correspondence between Hon. Richard Rush, the special agent of this government, and the officials and attorneys in England, an account of the suit in chancery which was found necessary to obtain the fund, an account of the residuary legacy or sum left in England as the principal of an annuity to the mother of the nephew of Smithson, and how this was finally obtained and added to the fund. The legislation of Congress in reference to the bequest is given, including a reprint of every resolution, memorial, report, speech, and act from the proceedings of Congress that have any reference to the fund or to the establishment and objects of the Smithsonian Institution, from December 17, 1835, when President Jackson first informed Congress of the bequest, down to the 1st January, 1878.

The collection of this part of the history involved a minute examination of every page of the "Globe," containing the report of the proceedings of Congress, and also a large number of documents and many of the records printed and in manuscript on file at the Capitol or elsewhere. The various plans proposed in the Senate and House of Representatives for the carrying out the intentions of Smithson, by John Quincy Adams,

Mr. Robbins, Mr. Choate, Mr. Marsh, Mr. Owen, and many others are given in full, and form an exceedingly interesting exhibit of the views of men in political life as to the best means of increasing and diffusing knowledge. This part also includes the history of the controversy in relation to the management of the Institution arising from the resignation of Mr. Choate from the Board of Regents, and the speeches of Senators Pearce, Mason, Douglas, Badger, and Clayton, and of Representatives English and Meacham, together with the reports of the Senate Judiciary Committee, and of a special committee of the House. As throwing light on much of Congressional action and to show the intense interest Mr. John Quincy Adams felt in the bequest, copious extracts are made from his diaries.

The volume also contains the various plans proposed for the organization of the Institution by scientific and literary men, including Mr. Rush, Dr. Wayland, Dr. Cooper, Dr. Chapin, with the report of the committee of organization of the Board of Regents; the programme presented by Professor Henry in December, 1847, and the opinions of this programme expressed by Dr. Beck, Professor Silliman, Dr. Gray, the American Academy of Arts and Sciences, the presidents of Columbia, Williams, Hamilton, Delaware, Pennsylvania, Georgetown, Amherst, Saint John's, Brown, Bowdoin, Charleston, Hampden Sidney, Madison, William and Mary, Cumberland, Alabama, Marietta, Tennessee, North Carolina, Trinity, and many other colleges and societies.

These articles will form parts of the Smithsonian Miscellaneous Collections, and will not only be of interest to the Regents and those immediately connected with the management of the Institution, but to all who wish to ascertain the views and acts of some of our most prominent men in relation to science for nearly half a century. The history of the Institution will show what difficulties surrounded its organization, the diversity of opinion as to its proper functions, the opposition to be overcome, and the value of the wide and comprehensive plans of the Secretary, Professor Henry, to whose clearness of conception, firmness of purpose, and purity of character the success of the Institution is mainly indebted. His views, though but little understood and appreciated at first, have steadily gained the favor of the scientific and literary world, and are now universally recognized as the best adapted to accomplish the great purpose of Smithson.

Bulletins of the National Museum.—In the Secretary's Report for 1875 (page 14) it was stated that, during the past year another series of publications, which would form a part of the Miscellaneous Collections, had been commenced under the above title. This series is intended to illustrate the collections of natural history and ethnology belonging to the United States, and constituting the stock of the National Museum, of which the Smithsonian Institution is the custodian. These bulletins, prepared at the request and mainly by the attachés of the institution, have been

printed under the authority of the Secretary of the Interior. They form an independent series, which has proved very acceptable to naturalists, as enabling them to obtain prompt information as to the additions to and the components of the National Museum.

The following is a list of the Bulletins already published:

No. 1. Check-list of North American Batrachia and Reptilia; by Edward D. Cope. 1875. 106 pp.

No. 2. Contributions to the Natural History of Kerguelen Island; by J. H. Kidder, M. D.; Part I, Ornithology; edited by Elliott Coues. 1875. 61 pp.

No. 3. Contributions to the Natural History of Kerguelen Island; Part II, Oölogy, Botany, Geology, Mammals, Fish, Mollusks, Insects, Crustaceans, Annelids, Echinoderms, Anthozoa; by Kidder, Coues, Gray, Endlich, Gill, Dall, Osten-Sacken, Hagen, S. J. Smith, Verrill, and S. F. Clark. 1876. 122 pp.

No. 4. Birds of Southwestern Mexico; collected by Francis E. Sumichrast. By George N. Lawrence. 1876. 56 pp.

No. 5. Catalogue of the Fishes of the Bermudas; by G. Brown Goode. 1876. 82 pp.

No. 6. Classification of the collection to illustrate the Animal Resources of the United States; by G. Brown Goode. 1876. 139 pp.

No. 7. Contributions to the Natural History of the Hawaiian and Fanning Islands, and Lower California; by Thomas H. Streets, M. D. 1877. 172 pp.

No. 8. Index to the names which have been applied to the subdivisions of the class Brachiopoda previous to the year 1877; by William H. Dall. 1877. 88 pp.

No. 9. Contributions to North American Ichthyology; Part I; Review of Rafinesque's Memoirs on North American Fishes; by David S. Jordan. 1877. 53 pp.

No. 10. Contributions to North American Ichthyology; Part II; Cottidæ, Etheostomatidæ, Percidæ, Centrarchidæ, Aphododeridæ, Dorysomatidæ, Cyprinidæ, Siluridæ. By D. S. Jordan. 1878. 120 pp., with 45 plates.

No. 11. Not yet published.

No. 12. Contributions to North American Ichthyology; Part III; by D. S. Jordan and A. W. Brayton. 1878. 237 pp.

Of the above, those published during the past year are the Bulletins numbered 10 and 12. The former comprises the second part of Prof. David S. Jordan's Contributions to North American Ichthyology, and includes notes on Cottidæ, Etheostomatidæ, Percidæ, Centrarchidæ, Aphododeridæ, Dorysomatidæ, and Cyprinidæ, with revisions of the genera and descriptions of new or little known species; and Synopsis of the Siluridæ of the fresh waters of North America, with a bibliography of all the genera and species. It forms an octavo pamphlet of 120 pages, with 45 plates.

The latter (No. 12) comprises the third part of Contributions to North American Ichthyology, including the distribution of the fishes of the Allegheny region of South Carolina, Georgia, and Tennessee, with descriptions of new or little known species; by David S. Jordan and Alembert W. Brayton. This paper is based primarily on the collections made by the authors and a party of students of Butler University, Ohio, during the summer of 1877, in various streams in the Southern States, classified under the following basins: 1, Santee; 2, Savannah; 3, Altamaha; 4, Chattahoochie; 5, Alabama; 6, Tennessee; 7, Cumberland. In the course of the investigations detailed in this paper some light has been thrown on the laws which govern the distribution of fresh-water fishes in general. A synopsis is also given of the family Catostomidæ; by David S. Jordan, and a bibliography is given of all the known works on Catostomidæ.

Proceedings of the National Museum.—In imitation of the practice of those learned societies which publish periodically descriptions of new species, &c., in the form of proceedings of weekly or monthly meetings, and thus present to the world the discoveries connected with the establishment at the earliest practicable moment, it appeared to be very desirable that the National Museum should have some medium of prompt publication for announcing descriptions of specimens received (many of which are new species), as well as other interesting facts relative to natural history furnished by the correspondents of the Institution. To meet this want, an order was obtained from the honorable Secretary of the Interior, authorizing the publication of a volume of "Proceedings of the National Museum" for the year 1878, not to exceed 500 pages.

The publication of the "Proceedings of the National Museum" has accordingly been commenced, the work comprising short descriptions of the additions to the Museum, and accounts of new species, or illustrations of species collected in particular regions of country. It is printed in successive signatures, as fast as copy sufficient for 16 pages is prepared, each signature having printed at the bottom of its first page the date of actual issue, for settling any questions as to priority of publication. It is at once distributed to scientific societies and leading naturalists in this country and in Europe. A large number of important articles of greater or less length have already been printed, to form the volume for 1878, now nearly completed. They consist of articles on new species of fishes collected by the United States Fish Commission; papers on the birds of the West Indies, collected under the auspices of the Smithsonian Institution, &c. Of this series, about 250 pages have been printed during the year 1878, being produced (as in the case of "Bulletins") at the expense of the Interior Department, by which all the disbursements connected with the service of the National Museum are made.

Reports of the United States Fish Commission.—A series of publications which may be considered as in some respects connected with the work of the Institution not only in the *personnel*, but in the subjects of natu-

ral history discussed and in the resulting contributions to our knowledge may properly be here noticed. The present Secretary being at the head of the United States Commission of Fish and Fisheries, and the work accomplished by this agency in increasing and diffusing scientific as well as practical information being quite within the objects and province of the Institution, much of the material would legitimately form a portion of the Smithsonian Contributions or Miscellaneous Collections. These reports are, however, published by the government, and are distributed by Congress.

Four volumes of this series have been published, each being of octavo size and comprising about 1,000 pages. The last of these reports, published in 1878, contains 1,089 pages, and embraces: (A) General considerations on the progress of operations; (B) Inquiry into the decrease of the food-fishes; (C) The propagation of food-fishes, as the shad, the salmon, the white-fish, and the carp; (D) Tables showing the distribution of shad, salmon, &c., the places, dates, and quantities hatched by the United States Fish Commission from 1872 to 1876. The Appendix contains a number of important papers, the most elaborate of which is a history of the American whale fishery, by Capt. Alexander Starbuck. This is followed by one on the carp and its culture, by Rudolph Hessel.

Smithsonian annual report.—The Annual Report of the Institution for 1877 was transmitted to Congress on the 6th of February, 1878, and 10,500 extra copies of it were ordered to be printed, 1,000 for the use of the Senate, 3,000 for the House of Representatives, and 6,500 for the Institution. It forms an octavo volume of 500 pages, with 49 wood-cut illustrations. The principal articles in the Appendix are a list of the more important explorations and expeditions, the collections of which have constituted the main sources of supply for the National Museum from 1850 (and even earlier) to 1877; a translation of Holmgren's memoir on color-blindness, in connection with which is reprinted an article on the same subject by Professor Henry, published in 1845; translations of the reports of the transactions of the Geneva Society of Physics and Natural History for 1875, 1876, and 1877, of Weisman's article on the change of the Mexican Axolotl to an Amblystoma, and of short memoirs on meteorological subjects, by Hann, Reye, Sohncke, Colding, and Peslin; notes on the history and climate of New Mexico, by Thomas McParlin, and brief articles on ethnological topics, by C. Rau, George L. Cannon, Moses Strong, J. N. de Hart, E. E. Breed, M. W. Moulton, Mrs. Gilbert Knapp, W. H. R. Lykins, James Shaw, J. Cochrane, George W. Hill, H. B. Case, F. Miller, Joseph Friel, W. M. Clark, Charles C. Jones, jr., W. B. F. Bailey, A. S. Gaines, K. M. Cunningham, S. S. Haldeman, A. M. Harrison, S. P. Mayberry, William M. Taylor, Edwin M. Shepard, George J. Gibbs, F. L. Galt, and Stephen Bowers.

ANTHROPOLOGY.

As in previous years, the subject of the anthropology of North America received special attention from the Institution. Its earliest publica-

tion, constituting the first volume of the "Smithsonian Contributions to Knowledge," was the work of Squier and Davis on the ancient monuments of the Mississippi Valley; and to this the inquiries of the past third of a century into the early history of man in the Northwest owe their chief impetus. The book is a universal guide, and is even now a standard. The edition at the command of the Institution has long since been exhausted, and it has been proposed to republish it to meet the urgent calls of the public. Unfortunately, the destruction of the wood-cuts by the fire of 1865 would render the cost of reproducing them so great as to make it doubtful whether it would not be better to use the money that would be needed for it in the preparation of a more extended work on the same subject, which has been in contemplation by the Institution for several years past.

In the list of publications of the year is mentioned an archæological circular, prepared by Professor Mason, and distributed in very large numbers. The object of this has been to secure information of the minutest details in reference to the construction of mounds, earthworks, and other traces of aboriginal engineering, as well as of articles of every description and character found in the mounds, in the graves, and in the superficial soil.

The answers to this circular have been unexpectedly abundant and varied, and a great mass of material is now in the possession of the Institution and in process of elaboration. The papers in relation to the mounds, earth-works, &c., are placed in the hands of Professor Mason, of Columbian University, for critical investigation and examination; and under his editorship they will be arranged and ultimately printed; together with numerous illustrations which accompany them. A series of maps will also be completed, containing information obtained from these and other sources, so that we shall have some satisfactory idea of their geographical distribution, extent, &c., throughout the country.

The investigation of the aboriginal relics is in charge of Prof. Charles Rau, the superintendent of the archæological department of the National Museum. As preliminary to a systematic work in this direction Prof. Rau has lately completed the rearrangement of the archæological collections of the Museum, carefully eliminating the duplicates, but retaining whatever may serve to illustrate the geographical distribution of forms and material, or the variation in pattern. Under his direction, also, numerous drawings have been made on wood and partially engraved.

A detailed statement of the donations to the National Museum relating to this branch of science will be found in the list of Contributors to the Museum, and also in the general account given subsequently, of the several additions to the Museum. It may, however, be well to call special attention to two northern collections in this department; one received from Mr. E. W. Nelson, a signal-station observer at Saint Michaels, in Alaska; the other from Mr. L. Kumlien, the naturalist of the Howgate expedition to Arctic America. These illustrate very fully

the nature and character of art among the Esquimaux on both sides of the continent, and with what has been heretofore obtained from the same region, as also the coast of Arctic America, through the agency of Mr. R. R. McFarlane, render this series the most complete of its kind in existence.

Special acknowledgment is due to the American Express Company, through Jas. C. Fargo, esq., general superintendent, for giving instructions to all the agents of the company to co-operate with the Institution in the collection of archæological material for the Museum.

METEOROLOGY.

Among the first objects of consideration by Professor Henry, after the commencement of active operations on the part of the Smithsonian Institution, was that of meteorology, and for more than twenty-five years it has received a large proportion of his own attention and consideration, as well as the aid of the Institution as far as its means would permit. Prior to the period named more or less attention had been paid to the subject, and efforts had been made to secure an extensive and continuous series of observations. These, for the most part, however, were limited to single places, and more rarely extended to counties or States; and it is to Professor Henry that we owe the establishment of a uniform system over an entire continent. Little by little the work was extended until, at the time of its fullest activity, it had its agents in nearly every county of most of the States of the Union; indeed, throughout the whole of British North America, and even in the remotest post of the Hudson's Bay Company, in Mexico and Central America, the services of observers were utilized. Some of these were provided with full sets of meteorological apparatus, so that observations could be made with the utmost precision; others had only a thermometer and barometer, while still others had nothing but a thermometer.

Several different series of blanks were distributed by the Institution corresponding to the different classes. The blanks were returned monthly and duly filed. In the earlier part of the work some instruments were furnished, such as barometers and thermometers. Subsequently, however, it was found that the expense was too great, and only occasionally were thermometers and rain-gauges supplied. There was, however, no lack of persons who were ready to take part in this system, and not only to give their time, but also to purchase their own instruments.

The interest of the observers was maintained by a constant correspondence with the Institution. Copies of the Smithsonian Reports and other publications were duly transmitted to them, and any inquiries or communications from them on scientific subjects were promptly responded to.

In this way a body of collaborators was secured to the Institution, whose services cannot be overestimated, since they not only furnished

information relating to meteorology, but they were always ready to supply information and assistance in other directions. To that body of men the National Museum owes a very large part of the extensive and complete series of illustrations of North American natural history that gives to it so great a prominence, this being the result of successive applications for aid from particular classes. Thus, whenever the attention of the Institution was directed to the fact that some particular branch of natural history required its fostering care, circulars were prepared and issued to the meteorological correspondents, invoking co-operation, and asking them to collect objects of the kind that might be found in their neighborhood, so that, not only all North American species might be gathered, but accurate determinations made of their geographical distribution. Very extensive responses usually followed these appeals, and in many cases sufficient material was secured to place the subject on a permanent and satisfactory basis. The works of the Institution on many orders of insects and on fresh-water and land shells, reptiles, birds, mammals, &c., were all based more or less entirely on collections and information obtained by the Smithsonian observers.

As a result, therefore, of over twenty-five years' observations by such men, the mass of meteorological information obtained became very great, and even though a certain per cent. of the observations could not lay claim to that minute accuracy which is generally required, yet it was found that, for many purposes, such as the general indications of variations in temperature, barometrical pressure, rain-fall, &c., in the collation of all observations the errors disappeared, and an average was secured which did not differ essentially from what would have been derived from more accurate observations.

The results of these observations have been published by the Institution in several forms. During the time when the work was carried on partly by the assistance of the Department of Agriculture, the reports of that establishment contained the general results. In 1855, two quarto volumes were published at the expense of the government. Subsequently, however, a system of special digests was undertaken under the supervision of Professor Coffin, for the winds; and of the temperature, rain-fall, &c., under Mr. Charles A. Schott, of the United States Coast Survey, a full account of which will be found in the former reports of the Institution.

A second edition of the work on the Winds of the Globe, commenced by Professor Coffin, and unfinished at his death, a few years ago, was completed under the auspices of his son, and published by the Institution. This is one of the most important treatises on meteorological science that has ever appeared from any press.

Shortly after being honored with the appointment as Secretary, I invited a committee, consisting of Mr. Charles A. Schott, Prof. Cleveland Abbé, and Mr. William Ferrel, to consider the subject of the unfinished meteorological work of the Institution, and to suggest a plan by which

it could be carried on and completed, with due reference to the state of its finances. This committee met at the Institution and carefully considered the whole subject, with the manuscripts before them, and concluded that a new edition of the rain-fall tables should be completed as soon as possible, this being a subject of great interest, both theoretically and in its practical applications. An allowance was therefore made for the completion of this work, and it will be ready for the press during the present year. The publication of this new edition of the rain-fall tables will be commenced and completed as soon as practicable. The barometrical reductions, the digest of the periodical phenomena of animal and vegetable life, &c., will be prosecuted as rapidly as the funds of the Institution will warrant.

It is, of course, unnecessary to refer to the fact that active operations in regard to meteorological observations, in accordance with the policy of Professor Henry have been transferred to the Weather Bureau of the Signal Department of the United States Army, under the care of General A. J. Myer, and that hereafter the meteorological expenditures will be confined to completing the presentation of the results obtained during the twenty-five years of the active work of the Institution in that direction.

RESEARCHES.

The appropriation made to Dr. H. C. Wood, jr. in 1876 and 1877 for experiments to determine the nature and cause of the increased temperature of the body during fever has been expended and a report of the investigations is being prepared for publication by the Institution. A brief abstract of this memoir. will be found in the appendix to this report.

The first point to be determined was whether fever was as complex as it appears, or whether there be not some dominant symptom characteristic of the process. By artificially heating living animals, generally and locally, it was found that elevation of the bodily temperature is sufficient to produce all the nervous and circulatory symptoms of fever and that the cooling of the heated part is capable of removing the symptoms, so that fever may be defined to be a morbid process which produces elevation of the bodily temperature.

The next point was to determine whether the increase of the bodily temperature in fever was due to an increase of the amount of heat produced, or to the failure of the body to throw off its heat. For this purpose the laws governing the production and loss of animal heat in health were studied by means of calorimetric and cardiometric observations on animals under various conditions, and it was determined that there is in the cortical region a nerve-center which controls the production of animal heat.

The subject of fever itself was then investigated. The experiments were mostly made upon dogs, each experiment continuing for from three to six days. Thermometrical readings were made every twenty minutes

by night and by day, and the normal and febrile states were studied both when food was administered and when withheld. The result of this was to show that there are two sources of animal heat, one from the stored-up materials of the body, and the other from the food, the first being the one manifested in fever.

The results of the whole investigation are summed up in eleven conclusions which are given in the abstract referred to.

The publication of recent investigations of the motion of the moon* has rendered a re-discussion of the ancient solar eclipses desirable. This work has been commenced under the auspices of this Institution by Mr. D. P. Todd, M. A., Assistant Nautical Almanac Office. Hansen's tables of both the sun and moon are employed, the latter being corrected from the results of Professor Newcomb's researches. So far as the work has now progressed, the computations relate to seven eclipses—those of Thales, at Larissa, of Ennius, of Agathocles, at Stiklastad, and the two eclipses of the thirteenth century which have been discussed by Celoria, of Milan. The adopted value of the secular acceleration having been deduced from entirely independent data, it is hoped that this investigation will throw new light on the interpretation of the ancient eclipses, and point toward the true value of the secular acceleration which ought to be adopted in the construction of new tables of the moon. The progress of this investigation will be much facilitated by the new tables of eclipses,† now in press; and it is proposed to extend the original scope of the research to include a large number of supposed ancient ecliptic dates.

LABORATORY.

The original act of Congress calls for a laboratory as one of the elementary features of the Institution, and an establishment of this kind has always been maintained, with a greater or less degree of efficiency.

In consequence of the limited appropriations by Congress for the maintenance of the National Museum, it has for several years been impossible to secure the services of a mineralogist. Arrangements have been made, however, for such an officer; the laboratory has been put in thorough order; additional fittings have been introduced, necessary for its efficiency, and a complete stock of chemicals and other materials procured. It is now in proper condition for the prosecution of investigations requiring chemical and mechanical appliances.

The principal work of the laboratory at present is examining minerals sent to the Institution for that purpose from various parts of the country, very few days passing without the reception of one or more parcels, many of them from members of Congress, requiring consideration. The Institution does not undertake to make quantitative analyses, ex-

* Researches on the Motion of the Moon. By Simon Newcomb, Professor U. S. Navy. Washington Observations for 1875, Appendix II.

† Tables of Eclipses, from B. C. 700 to A. D. 2300. By Simon Newcomb, Superintendent Nautical Almanac. Washington, 1879.

cepting in behalf of the government, but is always ready to indicate the general composition of specimens sent for the purpose.

The laboratory will also be used in the identification of large quantities of crude mineral substances in charge of the Institution, to be classified preliminary to the selection of duplicates and their distribution to colleges and academies of the United States.

TELEGRAPHIC ANNOUNCEMENT OF ASTRONOMICAL DISCOVERIES.

As in previous years, the Institution has served as the medium for telegraphic communication between astronomers of the Old and New World, in regard to such astronomical discoveries as require prompt announcement, for the purpose of having all their phenomena investigated by concurrent action on both sides of the ocean. An accompanying list represents the announcements referred to and the dates at which they were respectively made. This feature of the work of the Institution is one of great importance, and is a very satisfactory demonstration of the extent to which its labors are prosecuted for the world in general, and not merely for a restricted portion of the United States.

The following is a list of the minor planets discovered in 1878:

No.	Name.	Date.	Discoverer.	Discoverer's No.	Observatory.
180	Garumna	January 29	Perrotin	5th.	Toulouse.
181	Eucharis	February 2	Cottenot	1st.	Paris.
182	Elsbeth	February 7	Palisa	12th.	Pola.
183	Istria	February 8	....do	13th.	Do.
184	Deiopeia	February 28	....do	14th.	Do.
185	Eunike	March 1	Peters	28th.	Clinton.
186	Celuta	April 6	Pr. Henry	?	Paris.
187	Lamberta	April 11	Coggia	2d.	Marseilles.
188	Menippe	June 18	Peters	29th.	Clinton.
189	Phthia	September 9	....do	30th.	Do.
190	Ismene	September 22	....do	31st.	Do.
191	Kolga	September 30	....do	32d.	Do.

The comets of 1878 have been—

Comet I, discovered July 7, by Lewis Swift, of Rochester, N. Y. This comet was observed in America by Dr. C. H. F. Peters only, the majority of American observers being in the West on eclipse expeditions. It is probably identical with a comet discovered by P. Ferrari at Rome in July. On July 20, Tempel's periodic comet was found by Winnecke, quite away from its ephemeris place.

Encke's comet was found on August 3 by Mr. Tebbutt, of Windsor, N. S. W.

CORRESPONDENCE.

Mention has been made by my lamented predecessor on several occasions of the general character of the correspondence of the Institution,

and of its increasing extent. As might naturally be expected, this is now greater than ever before.

During the past year the number of letters received and sent out exceeded that for any previous corresponding period in the history of the establishment, the latter covering about 8,000 pages of press copy books. This increase was largely due—

(1) To renewed activity in the department of exchanges;

(2) To the execution of a comprehensive plan for extending the archæological cabinet of the Institution; and

(3) To the acknowledgment of letters of condolence on the death of the late Secretary.

As explanatory of the first of these sources of increase in the correspondence it may be stated that some months since a systematic effort was made looking to the early completion of as many as possible of the series of publications of foreign societies in the Smithsonian library, and, reciprocally, to supplying deficiencies in the numerous series of Smithsonian publications held abroad. To this end a communication was addressed to each of the nearly 3,000 foreign establishments in correspondence with this Institution, mentioning the volumes or parts of their respective transactions not at the time in possession of the Institution, and requesting that these be supplied; one of the conditions of a favorable response being a promise that the Smithsonian Institution would, in turn, fill whatever gaps it could in its own series. The responses, as was expected, were very prompt and most gratifying. Resulting therefrom, the Smithsonian library—now constituting the science library of the government—has been enriched by the addition of hundreds of valuable works of a character not usually obtained even by purchase, while the Institution itself has been brought into closer and more active relations than ever with its foreign correspondents of both hemispheres.

Regarding the second source of increase in the correspondence, it may be remarked that more recently a wide-spread distribution has been made of a circular relative to archæology. Indeed, it is hardly too much to say that this circular has been scattered broadcast over the land. Not only was it distributed to organized establishments of a literary, educational, and scientific character, to newspapers, postmasters, and, by generous permission of express companies, through their agents to individuals who might be known to them as specially interested in the subject, but a copy was systematically mailed with each *written* communication sent out by the Institution, no matter what the subject. This circular has proved more prolific of correspondence than was anticipated by its most sanguine friends. Inquiry soon followed inquiry for more detailed information as to desiderata in the way of specimens and information; requests were continuous to know if this or that article would be welcome; offers to lend objects for copying were numerous from individuals possessing unique and choice specimens, val-

uable to them only as heirlooms or curiosities, but who, while easily convinced of the little value of isolated collections in comparison with the importance to science of one grand, complete series, could not be persuaded to part with their archæological treasures; now and then private cabinets of more than ordinary character and extent have been brought to light; and, finally, modern "manufactories" of relics have been detected, and in this way forgeries, to some extent, driven from the market. Thus an extra amount of correspondence has been entailed that has proved no inconsiderable addition to the previous arduous labors of the officers of the Institution.

As the result, the Institution has received hundreds of specimens from all parts of North America as gifts, while by making copies in plaster or metal it has added to its cabinet many forms that would otherwise be unknown and inaccessible to the student as well as to the public at large. Many of these objects have proved of great archæological interest, and while not a few of them are almost indispensable for comparative study, all are more or less valuable in the elucidation of questions relating to the geographical distribution of aboriginal remains in the United States, and for filling gaps in State series. Moreover, by soliciting illustrations and descriptions of the rarer or more curious forms in private cabinets, the Institution has been saved much expense for transportation, its archæological experts rarely finding recourse to the original specimen necessary in determining what is or is not a desideratum.

As in previous years, the Institution was the recipient in 1878 of a large number of communications, having as a principal object the overturning of theories established by Newton and others, which, founded on experiment and observation, have long since been accepted as true by the scientific world. These, as is usual with papers of this class, while purporting to furnish the only rational explanation of the phenomena to be accounted for, generally displayed a degree of assumption entirely out of keeping with the spirit of true science; and while it would not be a work of much moment to prove to the unprejudiced, who may be acquainted with the subjects of such essays, that the propositions enunciated are wholly at variance with the fundamental and generally accepted principles of science, it is always exceedingly difficult to convince the authors of these "new doctrines" that they are not in accord with the scientific world. It would sometimes appear either that they are incapable of receiving the truth, or that, convinced of the fallacy of their reasoning, they prefer to cling to a false notion of originality rather than confess their error. Such communications, never brief, have, from time to time, been simply reiterations of previous expressions. "Correspondence with this class" of writers, as has been most truly observed by the late Secretary, is, indeed, "not only very onerous but difficult to manage, inasmuch as the rejection of their propositions is generally attributed to prejudice."

Another class of communications of a more intelligent character was

also received during the past year, relating to subjects in physics and chemistry. In accordance with the custom of the establishment, these were submitted to gentlemen eminent in the several sciences to which they pertained, who for many years have cheerfully acted as collaborators of the Institution.

Although the Smithsonian system of meteorology was several years ago transferred to the United States Signal Office, communications continue to be received on practical questions connected with this subject. These with few exceptions have been referred to General Myer, and their authors so informed.

But increase in the correspondence of the Institution is by no means wholly attributable to the sources above mentioned. As the character of the establishment has become more widely known from year to year, the number of applications for information in the line of natural history has annually increased, particularly in botany, zoology, and mineralogy. In the last branch, supposed discoveries of mineral wealth are frequently made known to the Institution, and the specimens forwarded for examination—which is always gratuitous. The determination of their character, however, seldom requires more than a *qualitative* analysis, and in the great majority of instances the specimens are found to be of no commercial value.

EXCHANGES.

There is, perhaps, no one feature of the Smithsonian Institution by which its mission for the diffusion of knowledge, if not its increase, is more thoroughly accomplished than by its extended system of international exchanges. This began in the earliest days of the Institution, from the necessity of making some suitable arrangement by which its publications might be promptly transmitted to the learned societies of America and the world, and corresponding works received in return. This required the organization of a thorough system, including special arrangements for transportation agencies in the various parts of the United States and of foreign countries; and as the machinery was sufficient to carry a larger amount of material than that belonging to the Institution itself, it was considered in strict accordance with the policy of the Institution to offer its services to other establishments.

Year by year the number of participators in the exchange was increased, and at the present date it is world-wide in its extent. With very few exceptions the institutions of learning, not only of the United States but of all America, carry on the greater portion of their scientific exchanges with the rest of the world through the Smithsonian Institution. Among the outside countries more especially to be mentioned are Canada, Mexico, Chile, Venezuela, &c.

The institutions are for the most part scientific societies publishing transactions, colleges and universities, State historical and agricultural societies, and technological institutions. All the departments of government in Washington, with few exceptions, also depend upon the same

system for their foreign relationships. The system also includes the exchange of publications of special students in science.

For a long time the Smithsonian Institution carried on this work by the establishment of agencies through which its own transmissions were distributed to their destination, and from which all the returns were collected and forwarded to Washington. Of late years, however, in certain countries, these labors have been materially lightened by a portion of the exchange being undertaken by some learned society or by the government. These being constituted Smithsonian agents in their respective countries, receive whatever may be sent to them for distribution, collect the returns and transmit them, thus giving to the Institution the benefit of an intelligent superintendence of the work. The first of these organizations was that established some years ago by the University of Christiania, Norway; and by Holland in the patronage of the Scientific Bureau at Harlem, under the efficient supervision of Dr. E. H. Von Baumhauer. During the past year a similar organization has been effected for Belgium, and it is hoped that their number will continue to increase. Even now, without any formal arrangement to that effect, the Academies of Science of Stockholm, of Copenhagen, of Madrid, and of Milan discharge the services of agents of the Institution for their respective countries.

A still more recent movement has in contemplation the establishment of departments of exchange in all countries under the direction of their respective governments; and this is intended primarily to facilitate a mutual interchange of government documents, but is broad enough in its scope to include the publications of societies and of men of science. At present this arrangement has only been carried out formally for Belgium by the "Commission Belge d'Echanges internationaux," and for France by the "Commission Française des Echanges internationaux."

In the Appendix will be found the usual series of tables, showing, first, the number of parcels sent out by the Institution in behalf of establishments in North America; and, secondly, the packages received for the same parties. The total number of shipments of boxes, containing such transmissions, has not been quite so great in 1878 as in the year preceding. This was due to the interruption of the business caused by the death of Professor Henry, and in the desire, by the reorganization of departments, to give greater efficiency to that of the exchanges. On this account a large number of bundles have accumulated, which, however, will be distributed in the earlier months of the year; after which there will be no interruption to the usual routine of transmission.

Up to the present time the entire expense of this system of international exchanges has been borne by the Smithsonian Institution, beyond requiring that all outgoing parcels be delivered to the Institution free of expense. The enormous increase, however, in the number and bulk of the packages delivered to the Institution has made it necessary to charge a small amount on this class of transmissions, and under the

authority of the board, a circular has been prepared and issued, making one of the conditions of receipt the payment of five cents per pound on the parcels. This is actually below the cost, as it includes the expense of wrapping, of boxing, of forwarding, and a share of the salary of employés and agents, and other incidentals. It is about the same rate as is charged by the express companies for freight in bulk from Washington to Chicago.

To facilitate the business connected with the system of the Smithsonian exchanges the following rules have been adopted:

1. Transmissions through the Smithsonian Institution for foreign countries to be confined exclusively to books, pamphlets, charts, and other printed matter, sent as DONATIONS or EXCHANGES, and not to include those procured by purchase. The Institution and its agents will not receive for any address apparatus and instruments, philosophical, medical, &c. (including microscopes), whether purchased or presented; nor specimens of natural history, except where special permission from the Institution has been obtained.

2. The Departments or Bureaus of the United States Government to pay the Smithsonian Institution five cents per pound on their packages, which includes all expense of boxing, shipping, and transportation.

3. A list of the addresses and a statement of contents of each sending to be mailed to the Smithsonian Institution at or before the time of transmission.

4. Packages to be legibly addressed and to be indorsed with the name of the sender and their contents.

5. Packages to be enveloped in stout paper, and securely pasted or tied with strong twine—never sealed with wax.

6. No package to a single address to exceed one-half of one cubic foot in bulk.

7. To have no inclosures of letters.

8. To be delivered to the Smithsonian Institution or its agents free of expense.

9. To contain a blank acknowledgment, to be signed and returned by the party addressed.

10. Should *returns* be desired, the fact is to be explicitly stated on or in the package.

Unless these conditions are complied with, the parcels cannot be forwarded by the Institution.

Statistics of exchanges sent during the last ten years.

	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
Number of boxes..	112	121	108	179	196	131	208	323	397	309
Bulk in cubic feet	1, 033	1, 189	772	954	1, 476	933	1, 503	2, 261	2, 779	2, 160
Weight.....	23, 376	31, 383	28, 950	26, 850	44, 236	27, 990	45, 300	80, 750	99, 250	69, 220

The following table exhibits the number of foreign establishments with which the Institution is at present in correspondence, or, in other

words, to which it sends publications and from which it receives others in return:

Foreign institutions in correspondence with the Smithsonian Institution.

Algeria	6	Iceland	4
Argentine Republic	14	India	30
Australia and Tasmania	32	Italy	187
Austro-Hungary	156	Japan	6
Belgium	112	Java	5
Bolivia	1	Liberia	1
Brazil	10	Mauritius	3
British America	20	Mexico	16
British Guiana	3	New Zealand	15
Cape Colony and St. Helena	7	Norway	25
Central America	2	Peru	4
Chili	8	Philippine Islands	3
China	1	Portugal	32
Colombia	3	Russia	162
Denmark	28	Sandwich Islands	2
Dutch Guiana	1	Spain	24
Ecuador	1	Sweden	22
Egypt	8	Switzerland	73
France	327	Turkey	12
Germany	507	Venezuela	2
Great Britain and Ireland	369	West Indies	8
Greece	8	International societies	7
Holland	66		
		Total	2,333

Special reference has been made in previous reports to the arrangement by which Congress places fifty copies of all the publications of the United States Government at the disposal of the Library Committee of Congress. These copies are to be exchanged, under its direction, through the Smithsonian Institution, for correspondingly complete series of the publications of such other governments as agree to the proposition. At present, the number of sets amounts to thirty-two, and includes the following governments. Of these, several came for the first time into the arrangement during the year 1878, and seventy-three boxes of the publications referred to, each box measuring seven cubic feet, have been distributed:

International exchange of government publications in 1878.

	Boxes		Boxes.
Argentine Republic	2	France	2
Bavaria	11	Germany	2
Belgium	2	Greece	2
Brazil	2	Hayti	2
Buenos Ayres	2	Holland	2
Canada (Ottawa)	2	Japan	2
Canada (Toronto)	2	Mexico	2
Chili	2	New South Wales	2
England	2	New Zealand	2

	Boxes.		Boxes.
Norway	2	Sweden	2
Portugal	2	Switzerland	2
Prussia	2	Tasmania	2
Queensland	2	Turkey	2
Saxony	2	Venezuela	2
Scotland	2	Victoria	2
South Australia	2		
Spain	2	Total	37

LIBRARY.

In accordance with the arrangement entered into shortly after the fire of 1865, between the Smithsonian Institution and the Congress of the United States, all the publications received by the Institution, in exchange or by donation, are transferred to the Library of Congress. The following enumeration represents the sum total of such increment:

Statement of the books, maps, and charts received by the Smithsonian Institution during the year 1878, *and transferred to the Library of Congress.*

Volumes:		
Octavo, or less	860	
Quarto, or larger	403	
		1,263
Parts of volumes:		
Octavo, or less	2,356	
Quarto, or larger	2,620	
		4,976
Pamphlets:		
Octavo, or less	1,953	
Quarto, or larger	463	
		2,416
Maps and charts		74
Total		8,729

Of course, as heretofore, the more important works, like the publications of the leading scientific and industrial societies and academies throughout the world, by their aggregations have continued to render the Smithsonian library one of the most valuable of the kind extant. It is believed that no collection elsewhere contains so large a number of volumes of scientific transactions and journals, or in so complete a series.

For the purpose, however, of perfecting the catalogue, it is proposed, in the early part of 1879, to print a list of what the Institution possesses of this character, inviting contributions of deficiencies and promising similar courtesy, so far as the publications of the Smithsonian Institution are concerned.

The following is a list of some of the principal works received by the Smithsonian Institution in 1878:

From the Ministry of Public Works, Commerce, and Industry, Lisbon: O Archivo Rural, vols. i–xv, Lisboa, 1858–1874, 4to. Memoria sobre a População e a Agricultura de Portugal, Lisboa, 1868, 8vo. Chimica Agricola, por J. I. F. Lapa, Lisboa, 1875, 8vo. Geographia e Estadistica Geral de Portugal e Colonias, por G. A. Perry, Lisboa, 1875, 8vo. Relatorio do Conselho Especial de Veterinaria, Lisboa, 1873, 4to. Manual de Viticultura pratica, por Visconde de Villa Major, Coimbra, 1875, 8vo. A Agricultura no Districto de Vizen, por J. B. Reis, Lisboa, 1871, 4to. Fomento da Povoação Rural em Hespana, por D. F. Caballero, Lisboa, 1872, 8vo. A Lombardia a Suisse e o Monte Rosa, por E. de Laveleye, Lisboa, 1871, 8vo. Recenseamento Geral dos Gados no Continente do Reino de Portugal en 1870, Lisboa, 1873, 4to and Atlas. A Vinha e o Vinho em 1872, por A. B. Reis, Lisboa, 1873, 8vo.

From the Society of Medical Sciences of Lisbon: Journal da Sociedade das Sciencias Medicas de Lisboa, 1836–1877, Lisboa, 8vo (54 vols).

From the Ministerio dos Negocias da Marinha e Ultramar, Direcção Geral da Marinha, Lisboa: Bullarium Patronatus Portugalliæ, curante Vicecomite de Paiva Manso, vols. i–iii, and App., vol. i, Lisboa, 1868–1873, 4to (3 copies). Examen des Viagens do Doutor Livingstone, por José de Lacerda, Lisboa, 1867, 8vo (3 copies). Relatorios dos Governadores das Provincias Ultramarinhas, vols. i, ii, Lisboa, 1875, 4to (3 copies). Tratado de Hygiene Naval, por J. B. Fonssagrives, Lisboa, 1862, 8vo (3 copies). Descripção e Roteiro da Costa Occidental de Africa, por A. Magno de Castilho, vols. i, ii, Lisboa, 1866, 8vo (3 copies). Africa Occidental, vol. i, Lisboa, 1864, 8vo (3 copies). Regulamento para o Serviço de Sande Naval, Lisboa, 1871, 8vo (3 copies). Viagem da Corveta Dom João I a Capital do Japão no Anno de 1869, Lisboa, 1863, 8vo (3 copies). Historia Ecclesiastica Ultramarina pelo Visconde de Paiva Manso, vol. i, Africa Septentrional, Lisboa, 1872, 8vo (3 copies). Ensaios sobre á Estatistica das Possessões Portuguezas no Ultramar, vols. i–v, Lisboa, 1844–1862, 8vo (3 copies). Regulament para o Serviço de Fazenda a Bordo dos Navias do Estado, Lisboa, 1875, 8vo (3 copies). Relatorio ácerca do Servico de Sande Publica, Lisboa, 1871, 8vo (3 copies). As Possessões Portuguezas na Oceania, por A. de Castro, Lisboa, 1867, (2 copies). Codigo Commercial de Signals para uso Internacional, Lisboa, 1868, 8vo (2 copies), &c., &c.

From the Australian Museum, Sydney: The Mammals of Australia, illustrated by Miss Harriett Scott and Mrs. Helena Forde. With a short account of all the species hitherto described. By Gerard Krefft. Sydney, 1871. Folio.

From the Hellenic Philological Society of Constantinople: Periodical Journal (Greek), vols. iv–viii, Constantinople, 1871–1874, small 4to. Homeric Theology, by George Konstantinidos (Greek), Constantinople, 1876, 8vo, Les Grecs de l'Empire Ottoman, par A. Synvet, Constantinople, 1878, 8vo.

From the Government of France: Direction Générale des Douanes.

Tableau général du Commerce de la France, avec les Colonies et les Puissances étrangères, 1869–1875, Paris, 1871–1876, 4to (7 vols.). Tableau général des Mouvements du Cabotage, 1869–1875, Paris, 1871–1876, 4to (7 vols.).

From the Medical Society of the State of New York, Albany: Transactions, 1807–1831, 1867–1870, 1873–1877. Albany. 8vo (9 vols.)

From the State Library of Pennsylvania, Harrisburg: Reports on Geology, Mineralogy, Oil-Wells, &c., &c. Harrisburg, 1876–1878. 8vo (21 vols.).

From the Library of the German Parliament, Berlin: Stenographische Berichte über die Verhandlungen des deutschen Reichstages. iii. sess., 1875–76, vols. i-iii; iv. sess., 1876, vols. i–iii; i. sess., 1877, vols. i–iii; Berlin, 1876–1877, 4to. Reichs-Gesetzblatt, 1875–1876, Berlin, 4to.

From the University of Chile, Santiago: Anales de la Universidad de Chile, 1875–1876 (4 vols.), Santiago, 8vo. Memoria del Interior, 1876, vols. i–ii, Santiago, 8vo. Memoria de Relaciones Esteriores, 1876, Santiago, 8vo. Memoria de Justicia, Culto, &c., 1876, Santiago, 8vo. Memoria de Hacienda, 1876, Santiago, 8vo. Memoria de Guerra y Marina, 1876, Santiago, 8vo. Sesiones del Congreso National de Chile, 1875 (4 vols.), Santiago, 4to. Anuario Estadistico de Chile, vol. xvii, Santiago, 1876, 4to. Anuario Hidrografico de la Marina de Chile, año ii–iii, Santiago, 1876–1877, 8vo. Quinto Censo Jeneral de la Poblacion de Chile, 1875, Valparaiso, 1876, 4to. Coleccion de Tratados celebrados por la República de Chile con los Estados estranjeros, tomo ii, Santiago, 1875, 4to. La Chili tel qu'il est, par E. Seve, tome i, Valparaiso, 1876, 8vo. Historia de Chile, 1831–1871, por Don R. S. Valdes, tomo i, Santiago, 1876, 8vo. La Cronica de 1810, por M. L. Amunátegui, tomo ii, Santiago, 1876, 8vo. Ensaye sobre los depósitos metaliferos de Chile, por Don I. Domeyko, Santiago, 1876, 8vo.

From the Royal Academy of Sciences, Lisbon: Memorias da Academia, Nova Serie, tomo iv, v, parte i, Lisboa, 1872–1877, 4to. Decada 13 da Historia da India, i, ii, Lisboa, 1876, 4to. Portugalliæ Monumenta, 2 parts, Lisboa, 1873, folio. Subsidios para a Historia da India Portugueza, tomo v, Lisboa, 1868, 4to. Corpo Diplomatico Portugueza, tomo v, Lisboa, 1874, 4to. Quadro Elementar dus Relaões politicas e diplomaticas de Portugal, vols. xii and xiii, Lisboa, 1874, 1876, 8vo. Flora Cochinchinensis, vols. i, ii, Lisboa, 1790, 4to. Historia dos Estabelecimentos scientificos e areisticos de Portugal, toms iii, vi, Lisbon, 1873–1876, 8vo. Jornal de Sciences Mathematicas, toms iv, v, Lisboa, 1873, 1876, 8vo. Tratado Elementar de Optica, Lisboa, 1874, 8vo. Historia de Congo, Lisboa, 1877, 8vo. Carro de Meteorologia, Lisboa, 1869, 8vo. Chimica Agricola, Lisboa, 1875, 8vo.

From the British Government: Facsimiles of National Manuscripts of Scotland, selected under the direction of the Right Hon. Sir William Gibson-Craig, Bart., lord clerk register of Scotland, and photozincographed by command of Her Majesty Queen Victoria by Colonel Sir Henry James, part iii, Edinburgh, 1872, folio.

From the Royal Library, Stockholm: Government Documents, 1877, 1878, Stockholm, 17 vols. and 8 parts, 4to.

From the Government of South Australia, Adelaide: Acts and Ordinances of the Province of South Australia, 1837–1835, Adelaide, 4to (6 vols.). Proceedings of the Parliament of South Australia, 1857–'8, i, ii; 1858, i, ii; 1859, i, ii; 1860, i–iii; 1861, i–iii; 1862, i–iii; 1863, i; 1864, i–iii; 1865, i, ii; 1865–'6, i, ii; 1866–'7, i–iii; 1867, i–iii; 1868–'9, i–iii; 1869–'70, i–iii; 1870–'71, i–iii; 1871, i, ii; 1872, i–iii; 1873, i–iii; 1874, i–iii; 1875, i–iii; and special session, Adelaide, folio (53 vols.). Statistical Sketch of South Australia, by Josiah Boothby, London, 1876, 8vo.

From the Norwegian Government, Christiania: Norges Officielle Statistik, 13 volumes and 43 parts, Christiania, 1870–1876. Forklaringer til K. Norges Statsregnskab, 1875, Christiania, 1876, 4to.

From the second geological survey of Pennsylvania: Reports 1875–1878 (20 volumes).

From the Universities of Würzburg, Marburg, Berlin, Louvain, Bonn, Halle, Göttingen, Jena, Erlangen, Leipzig, Zurich, Greifswald, Heidelberg, Dorpat, and Freiburg: Inaugural dissertations for 1877.

From Dr. A. Ernst, Caracas: Statistical documents, 24 volumes, Caracas, 1875–1877, 4to.

From the Library of Parliament, Ottawa, Ontario: 18 volumes government documents.

From the State Library of Ohio: 14 volumes State documents.

An addition of special interest will be found in the palæontological library of the late Prof. F. B. Meek, whose death at the Institution, after many years' sojourn within its walls, was recorded in the report for 1877 (p. 10). Mr. Meek died without any known heirs, and his books being appraised in due legal manner, the Institution purchased them. This was the more desirable as, in regard to many of the works there was some uncertainty whether they had been presented to Professor Meek in his individual capacity or as the officer in charge of the palæontological department of the Institution. This question is, of course, now settled. The books of this library (especially the volumes enriched by copious manuscript notes and interpolations) have been repeatedly consulted by palæontologists and conchologists.

NATIONAL MUSEUM.

The relations existing between the Smithsonian Institution and the National Museum have been so frequently referred to by my predecessor that it is only necessary to mention briefly that the Museum constitutes no organic part of the Institution, and that, whenever Congress so directs, it may be transferred to any designated supervision without affecting the general plans and operations connected with the "increase and diffusion of knowledge among men." For the most part, the articles consist of the collections made by the United States surveying and exploring expeditions, and the expense of their care is entirely covered

by government appropriations, which have been sufficient to meet the actual cost of maintenance and a restricted supervision, although with a larger fund the Museum could be placed on a more satisfactory basis, and one much more serviceable to science.

Attention has been called, in several previous reports of my lamented predecessor, to the importance of suitable provision for the accommodation of the vast amount of material now stored in the Armory building and in the basement of the Smithsonian edifice, and thus withdrawn from public examination. This surplus consists of the following essential elements:

First, the collections made by the United States exploring expeditions.

Second, the contributions sent by private individuals who reside in every section of the country.

Third, the exhibits of the Smithsonian Institution, the Indian Bureau, and the United States Fish Commission, at the Centennial.

Fourth, the donations to the United States by domestic and foreign visitors and commissions on that occasion.

The number of private contributions to the National Museum continues to increase in value and magnitude year by year, and embraces specimens of mineralogy and geology, objects of American antiquity, and other desirable articles. The government surveys, too, of Messrs. Hayden, Wheeler, and Powell have furnished a very large number of specimens of great value as illustrating the reports published by these parties. It is, however, under the two last-mentioned heads (the Centennial exhibits and donations) that by far the greater amount of this unexhibited material is comprised.

By means of an appropriation by Congress, as fully set forth in the Reports for 1875 (pages 8 and 46) and for 1876 (pages 8–11, 42, and 75–77), the Smithsonian Institution was enabled to exhibit a very full collection illustrating the animal and mineral resources of the United States; the Fish Commission to present every variety of boat, net, hook and line, harpoon, and other fishing implements, as well as models and illustrations of all the fishes useful for food or other purposes; the Indian Bureau to show a valuable representative ethnological series of ancient implements, of dressed figures, and of objects illustrating the life and customs of the North American aborigines.

At the close of the Exhibition, the foreign commissioners, induced by a desire to do honor to the United States, presented, with scarcely an exception, the whole of their exhibits (corresponding with those made by the Smithsonian Institution) to the United States Government, embracing the contents of many thousands of square feet in the different Centennial buildings. Of forty-one foreign commissions, thirty-four gave to the United States either the whole of their displays or a full series, probably representing 75 per cent. of all such matter as was shown under the patronage of the respective governments.

Many private exhibitors from abroad made similar contributions, some

of these valued singly at over $20,000 each. A large proportion, too, of the more desirable exhibits by State commissions, as also of home exhibitors, was added to the mass, and nearly two months were spent at the close of the Exhibition in simply removing these articles to the government building and there packing them for transportation to Washington, a large force being required for the purpose.

The collection sent from Washington to Philadelphia filled twenty freight cars, and the donations received at the Centennial required forty more for their transportation, the entire amount to be brought to Washington making sixty car-loads, a quantity far beyond the storage capacity of the basement of the Smithsonian building.

In anticipation of these donations, Congress had previously authorized the transfer to the Smithsonian Institution, for the purpose of storage, of the Armory building, on the square between Sixth and Seventh streets, and made an appropriation to fit it up for the reception of the collections. To this building a portion of these collections was transferred, where they now fill four floors, of about 5,000 square feet each, from top to bottom, the remainder being stored in the basement of the Smithsonian Institution. At present, with the articles received from other sources, it is estimated that the quantity of objects not exhibited represents nearly five times the bulk of those at present displayed in the Smithsonian building.

It is to be understood, too, that these objects are not simply specimens of natural history, possessing an abstract interest to the student, but represent the application of natural objects to the industries, and as such are of great importance. In what is now a fairly complete series of economical minerals, such as ores, combustibles, building stones, clays, earths, &c., from all parts of the world, with their incidentals of reduction and application, and specimens of similar objects of art and industry derived from them, we have a collection of very great industrial importance, for it furnishes to the American manufacturer and designer information of the utmost value. The illustrations of means and appliances for the pursuit, capture, and application of food-fishes, from all parts of the world, are also of exceeding value, while the articles of Indian manufacture from Alaska, Washington Territory, and the Prybilov Islands are of the utmost interest.

Several donations from foreign countries are of considerable magnitude and importance; the first being from the King of Siam as a present to the United States Government; the second the display of the manners and customs of the Chinese made by the Chinese Commissioner; the third an exhibition of the industries illustrating the manners and customs of the Japanese, presented by the Japanese Government. The intrinsic value of all these objects presented to the United States is very great, having probably cost their respective contributors, either governments or individuals, not far from three-quarters of a million to a million of dollars.

The necessity, therefore, of some adequate means of displaying this rich collection, now withdrawn from the inspection of the public, has weighed very heavily upon the officers of the Smithsonian Institution, and several efforts have been made to secure an appropriation from Congress for the erection of a fire-proof building sufficient to contain it, but of the most inexpensive form of construction compatible with protection against fire, and allowing the greatest convenience of display. A plan was prepared on the basis of suggestions from General Meigs, and approved by the Committees on Public Buildings and Grounds of both the Senate and House. The Senate, at the second session of the Forty-fourth Congress, passed a bill appropriating $250,000 for the erection of a building of the kind, without a dissenting vote. This also passed the House; but obtained only a majority vote, under circumstances requiring a two-thirds vote.

A bill making an appropriation for the erection of such an edifice was again introduced into Congress at the current session, which it is hoped will be more successful. Owing to the particular form of construction of the proposed building, it can be completed in probably not more than a year, and the collections removed into it.

It is now proposed to place this building in the southeastern corner of the reservation of 52 acres, situated between Seventh and Twelfth streets and North and South B. It will be so situated as not to obstruct the view of the Smithsonian from the Capitol or from any other important point. As originally contemplated, the building was to occupy the space between the present Smithsonian edifice and Twelfth street; but it was finally concluded that if placed there it would obstruct the view of the Agricultural building, and the change of location was accordingly determined upon.

Attention was called by the report for 1877 (page 36), to the continued increase of the number and variety of the collections received during the year, the exceptional year of the Centennial being the only one that furnished a larger quantity of material. The returns for 1878 have again been much larger than usual, exceeding considerably those of the previous year. The total number of donors was 635 for the year, to 335 in 1877, of which 180 were contributors to the collections of the United States Fish Commission at Gloucester. The number of donations was 455, to 489 in 1877; and of separate packages 1,197, to 815 in 1877. A large part of the increase is due to the extensive contributions made to the United States Fish Commission by the fishermen and merchants of Gloucester, Mass., in which city the Commission has had a station for the prosecution of researches and the propagation of food-fishes during the last half of the year. The hearty appreciation, by all classes of the community, of the operations of the Commission, caused those fishermen residing at the port to save many articles brought up on the trawls from the deep water, and to bring them to the office of the Commission at Gloucester. The result is to be seen in several hundred donations, some

of them embracing specimens of very great interest, and adding largely to our knowledge of the distribution of animal life in the waters off the coast of New England. As the result of these contributions, together with the gatherings of the Fish Commission itself, many species of fishes and of marine invertebrates have been added to the fauna of the country, several of them being entirely new; others were previously found only in the deep waters off the European coast or in those of Spitzbergen and Greenland.

Reference is, of course, quite impossible to even a small percentage of those collections added to the National Museum during the year covered by the present report, and they will be found under the names of the donors, alphabetically arranged, in the appendix. Even this, however, fails to give a complete idea of the magditude of the additions, as a collection embracing from five to twenty or more boxes may be included in a single line of the record. The books of the Institution, in which all these articles are entered systematically, give a more detailed statement; and the fact that a portion of these has required 9,973 entries, will furnish some idea of the aggregate.

Among the more important general collections received are those made by the United States Fish Commission at Gloucester, as already referred to, embracing a complete and exhaustive series of the marine animals of the ocean between the New England coast and that of Nova Scotia, Newfoundland, and the outer Banks, including the Georges, the Grand Banks, Flemish Cap, Le Have, Bank Quero, &c. This material embraces a great many duplicate specimens, which will, in time, be distributed to the educational and scientific establishments of the United States.

Next to this in importance and magnitude are two collections from the far North, one from E. W. Nelson, Signal Office observer at St. Michaels, in Alaska, consisting very largely of ethnological articles and birds; the other made by Mr. L. Kumlien, while a member of the Howgate expedition to Arctic America, this embracing much the same class of objects as those sent by Mr. Nelson.

The collection of birds and ethnological articles, gathered by Mr. Ober in the islands of the West Indies, to which further reference will be made, has also been of great moment. Mr. J. Zeledon, formerly an assistant in the Institution, and for many years resident in Costa Rica, visited Washington in the spring of 1878, bringing a very large collection of birds, mammals, &c., of his country.

Large collections have also been received from Lieut. George M. Wheeler, the proceeds of the expeditions of 1877 and of earlier years, transmitted by him in accordance with the law of Congress requiring their deposit in the National Museum.

In another part of the report will be given a more detailed account of some of the explorations to which reference has been made.

Following the plan of previous reports, we shall now proceed to indi-

cate, briefly, the character of the more important additions to the Museum in systematic sequence with some reference to the result in increasing our knowledge of particular regions.

Anthropology.—Beginning with anthropology as the most interesting and important of such additions, I may refer again to the collections made by Mr. Nelson at Saint Michaels. These are very exhaustive and complete, and taken in connection with those sent by Mr. Lucien M. Turner from the same region supply a very full illustration of manners and customs of the Indian and Esquimaux races found in northwestern America. A special feature of Mr. Nelson's collection, like that of Mr. Turner, is the immense variety of carvings in bone and wood, representing various animal forms either in contour or in simple lines; the latter calling to mind the engraving upon bone, especially of antlers of reindeer found in the caverns of France and Germany, and throw much light upon the region and character of these remains. Many models of boats, traps for securing animals, fishing apparatus, articles of clothing, and many other objects constitute the mass of the great collection sent by Mr. Nelson.

Not at all inferior in interest, and only less in extent, are the collections of Mr. Kumlien made by him during several months' residence at Cumberland Gulf, in Arctic America, and on the opposite coast of Greenland. They include great numbers of ancient stone implements found in the Esquimaux graves, and supply a previous deficiency in the collections of the National Museum. There are also many articles of dress and adornment, implements of war, and the chase, &c. In the last year's collections of both Mr. Nelson and Mr. Kumlien are many stone implements, objects of horn, bone, or wood, illustrating in a very high degree the functions and applications of certain articles of stone familiar to the American archæologist, the uses of which were previously conjectural. These embrace scrapers, knives, planes, gouges, drills, and many other articles.

During the past year the attention of the Institution has been called especially to the subject of the soap-stone quarries, where the aborigines obtained their material for soap-stone bowls, dishes, &c., constituting so common a feature in American archæology, but the source of which has been heretofore but little noticed. Of these quite a number were met with during the year, and an examination more or less extensive has been made of each under the auspices of the Smithsonian Institution.

During the spring of 1875, some specimens of steatite were received from the quarry of John B. Wiggin, in Chula, Amelia County, Virginia. Among these were fragments of rude vessels, which, from their number and unfinished condition, were regarded as indicating that the place in question was once an aboriginal mine. Mr. Wiggin was requested to carefully save and forward all specimens of the kind which he might discover; and the receipt from him during the centennial year of an additional collection proved beyond doubt the correctness of the conjecture.

Inasmuch as, at the time, no quarry of this kind had been discovered,* and as, moreover, aboriginal methods of mining and working pot-stone were entirely unknown, it was thought advisable to have a careful exploration of the place undertaken, which was intrusted to Mr. F. H. Cushing, who visited the locality in June last, causing excavations of sufficient extent to be made to reveal a large portion of the rock-surface worked by the Indians. Again, in August and September, furnished with suitable instruments, and a complete photographic outfit, he continued these investigations, and, with the sanction and kindly aid of Mr. Wiggin, was enabled to greatly extend the diggings, thus making his examination very thorough and sufficient.

The surface indications of aboriginal quarrying were found to be shallow circular depressions, from ten to seventy feet in diameter. Mr. Cushing began operations by causing a space of earth, 60 feet in length by 40 in width at the base, to be cleared away from the center of the largest of these depressions. Everywhere over the rock-surface, thus exposed he found grooves and hollows made by the Indians in taking out sugar-loaf shaped masses of the rock; and throughout the soil removed he found numerous fragments of these masses mostly hollowed as the beginning of pots, together with equally numerous rude quartz-picks, some broken axes and mauls, and a few hammers of soapstone, which had been used in quarrying and working the material.

From the base of the triangular excavation a cutting was made, about 17 feet in width by nearly 40 in length. This was extended to the left 18 feet, to remove the earth from around a large out-cropping bowlder, from the base of which it was found that the Indians had cut the rock away piece by piece, until only a slender stem remained as its support. Another extension, nearly 40 feet to the right and 30 feet wide, laid bare one side and the center of a second quarry almost as much worked as the first. From this last a ditch 3 feet wide was carried forward more than 80 feet, all along the course of which were found Indian cuttings wherever the rock-surface was exposed. Thus the area worked over by the aborigines in one direction was shown to be not less than 180 feet. How far to either side of this their work extended can only be conjectured. The number and extent of those depressions not excavated, however, seemed to indicate that less than one-third of the Indian work was exposed by the diggings just described. Mr. Cushing not only procured from the earth removed, a collection of several hundred specimens, but also made and brought away photographic views and accurate plaster models of portions of his diggings.

Attention being drawn to these explorations while in progress by notices in some of the Washington newspapers, Mr. Elmer R. Reynolds, of the city, brought to notice some similar specimens of vessels which he had found within the District, on Soapstone Run, a branch of Rock Creek,

*Intelligence had been received of some surface workings in Chester County, Pennsylvania; so slight, however, that they could hardly be regarded as quarryings.

which were recognized at once as indications of another quarry, and Mr. Cushing was directed to make a thorough examination of it. Here, as in Virginia, depressions along the hill-side in which the quarry occurred showed that the Indians had worked the underlying ledge, although excavations subsequently made revealed the fact that they had depended mainly upon surface material for their supply. Large numbers of unfinished vessels, quartz-picks, hammer-stones, &c., were here found.

Another quarry has been repored by its proprietor, Mr. M. E. Holmes, as occurring on the right bank of the Potomac above Little Falls. This, though rich in ancient remains, has not yet been thoroughly examined by the Institution.

Mr. J. D. McGuire, of Ellicott City, Maryland, called our attention to still another quarry, not unlike the one on Rock Creek, and remarkable for the fine specimens of Indian work that it furnished. Through the hospitality and kind assistance of this gentleman, Mr. Cushing was enabled during the month of December to make a personal examination of the place, and secure for the museum nearly two hundred superior specimens.

It may be well to add that since the discovery of the Virginia quarry, public attention having been drawn to this kind of research by widely circulated newspaper notices, similar sources of aboriginal supply have been discovered in Rhode Island, Massachusetts, Connecticut, Pennsylvania, Tennessee, Georgia, Alabama, and Wyoming, from several of which the Institution has already received specimens.

An aboriginal quarry, recently discovered near Providence, R. I., on the farm of Mr. Angell, was visited by myself in July, accompanied by Professor Jenks, through whose assistance I was enabled to obtain specimens of the unfinished pots and of the mining apparatus.

Reference has already been made to the plans of an extensive work on the American Stone Age, to be prepared under the direction of the Institution, to serve as a manual for this department of archæology. The publication of the circular referred to as among the publications of the Institution for 1878 has been of great benefit in bringing in both large and small collections, as will be seen by reference to the list of donations. Every part of the country is represented in these returns, which are so many indeed as to render it somewhat invidious to select any for special notice. Justice, however, to the contributors, makes it proper that I should mention a few of these in greater detail.

The first collection to be noted is that presented by Mr. A. B. Crittenden, of Middletown, Conn., a large and extensive one, made during several years of effort. This is particularly rich in the shell heap or Kjökenmoedding deposits, from Cape Cod, showing a variety and complexity not previously exhibited.

To one correspondent, Mr. J. E. Gere, of Riceville, Wisconsin, of the Institution, is indebted for an important increase of its collection of ancient copper implements. Mr. Gere, during a visit to the Institution,

three years ago, had his attention called to the paucity of such objects in the National Museum, and offered his assistance in obtaining and forwarding such specimens. As the result of his promise, the Institution has received from him during the year a large number of these articles, greatly adding to the variety of the series. Masses of native copper, plowed up by Mr. Gere on his own farm, were sent to illustrate the source of the material of these implements, and to show that it does not necessarily follow that it must have been obtained in barter or otherwise from the copper mines of the Lake Superior region.

From Mr. William Brady, of Minong, in the Lake Superior region, was received a barrel of hammers, used by the ancient miners in that vicinity, enabling us to make a very interesting comparison between these and corresponding instruments used by the Indians in working the soapstone quarries already referred to.

The collections received from Dr. Frank L. James, of Arkansas, are of great beauty and variety, as also those from Professor Randle, of Kentucky.

The result of long-continued examinations of shell mounds in Florida by Mr. Henry J. Biddle, of Philadelphia, is also of very great value.

Dr. Benjamin H. Brodnax, of Louisville, in continuation of previous sendings, has contributed articles of special interest; and the collections made in Lancaster County, Pennsylvania, by Dr. T. H. Bean and Mr. Galbraith, have also added greatly to the specimens from that State.

Among the more important collections received from regions outside of the United States is a number of implements, vases, &c., from Peru, presented by Mr. W. W. Evans, who has been for many years a correspondent of the Institution, and a contributor to the National Museum.

The archæology of Japan is represented by collections received from Professor Morse, consisting of shell-heap pickings and mound diggings on the Japanese coast. The fragments of pottery in this collection are rude and unfinished, scarcely more advanced than those found in the ancient graves and mounds of North America. They are supposed to have been the production of the Ainos of the early days, who are believed to have occupied, at one time, the entire country.

An interesting contribution to European anthropology was made by Professor Kollmann, who presented a series of crania of the earlier, although scarcely prehistoric, inhabitants of Germany.

Mammals.—While many single specimens or small collections of mammals have been received from various parts of the country, those received from Lieut. George M. Wheeler, of the Engineer Bureau, representing quite a variety of species, collected by Mr. Henshaw and other collaborators of the survey, deserve special mention.

A series of the seals of Arctic America, both of skins and skeletons, brought back by Mr. Kumlien, supplies a very important gap in the collections of the National Museum, exhibiting the variations of condition

in several species, from the fœtal to the adult state, of both sexes, with corresponding skeletons of all these gradations.

The collection brought by Mr. Zeledon includes nearly all the known mammals of Costa Rica, from the largest to the smallest, and in most admirable condition of preservation, well fitted to mount for exhibition in the National Museum.

The Zoological Society of Philadelphia has presented a specimen, in the flesh, of the *Aodad* (*Ovis Tragelaphus*), which died in the menagerie of that establishment.

From the Public Library and Museum at Calcutta, in India, under the direction of Mr. Murray, was received quite a number of specimens of Indian mammals, including skins of the smaller kinds, and a considerable number of stuffed heads of tigers and other felidæ, as well as several crania of much value.

Birds.—The collections of birds received during the year have also been extensive and important, as shown by the number of specimens entered in the record book. Principally noteworthy is the donation by Mr. George B. Sennett, of Erie, Pa., of a series of the collections made by him during the preceding year in the vicinity of Brownsville, Tex. This embraces several species new to the Museum. In view of their admirable preparation, it is proposed to mount the greater part of them for permanent exhibition in the Museum.

From Dr. James C. Merrill, U. S. Army, stationed at Brownsville, Texas, was also received a very acceptable collection of skins and eggs of birds, from that region.

The collections of Mr. Nelson in Alaska and of Mr. Kumlien in Arctic America, already referred to, embrace many species of much interest, although none actually new to the Museum.

The more important addition made to the collection has been a series of oceanic birds, found off the coast of the United States. Mr. Raymond L. Newcomb having been sent out by the Smithsonian Institution on board the schooner Marion, Captain Collins in command, for the purpose of ascertaining what were the birds occurring on the fishing-banks, in such numbers as to be serviceable in furnishing bait for the capture of codfish, he brought back a large and well-prepared collection, embracing some quite rare species, although none previously unrepresented. Some of the plumages were new, and it became possible, from the collections and his notes, to interpret the meaning of various appellations employed by the fishermen.

For the assistance rendered to Mr. Newcomb, as well as in furnishing information to the Fish Commission, Captain Collins and his crew deserve special mention.

Of extra-limital collections, those made by Mr. Fred. A. Ober in the West Indies, referred to in another part of this report, are of particular value and importance. As the result of these the National Museum is now in possession of by far the most complete series extant of birds of

the West Indies, showing better than any found elsewhere the geographical distribution peculiar to each island, and the precise distribution of those common to two or more islands.

To this end especially have contributed the labors of Dr. Henry Bryant, in the Bahamas, and of Mr. William T. March, in Jamaica; of Dr. John Gundlach, Mr. Charles Wright, and N. H. Bishop, in Cuba; of Mr. Alfred Newton, in Santa Cruz; of Mr. George Latimer, and Mr. Thomas Swift, in St. Thomas and Porto Rico; of Dr. Bryant, in Porto Rico, and of Mr. Galody, in Antigua.

Not only were many species previously described contained in Mr. Ober's collection, but he furnished types of nearly twenty new species.

A series of memoirs, by Mr. George N. Lawrence, published in the "Proceedings of the National Museum," includes lists of the collections and embraces descriptions of the new species.

From foreign regions an interesting collection, for the most part of water-birds, was sent from the Bosphorus by the Robert College of Constantinople, and one from the coast of Syria by Mr. William T. Van Dyck.

Reptiles.—Reference has been made in previous reports to a very extensive collection of casts of American fishes which were prepared originally for exhibition at the Centennial, and continued since then by the addition of new species, coming to the Institution in proper condition for reproduction.

It was determined to include the North American reptiles in the series of life reproductions of such objects as are not easily exhibited as stuffed specimens. In order, therefore, to secure living objects from all parts of the country, a circular was distributed, inviting contributions of serpents, frogs, lizards, and salamanders, in all their variety; and, as in previous appeals from the Institution for assistance, the response was generous and extensive. A large number of specimens, both of rare and common species, was received, and kept the entire force of Smithsonian artists occupied during the year.

Resulting therefrom, the National Museum now has an extremely interesting and attractive collection of these animals in their natural attitudes, either as plaster or papier maché models, and very carefully colored from sketches made while the animals were alive. In some cases it was found possible to make the casts from the living specimens, and in several different attitudes, from the same individual. As heretofore, the casting and molding have been under the direction of Mr. Joseph Palmer, assisted by Mr. A. J. Forney and Mr. William Palmer. The coloring of the reptiles has been performed by Mr. A. Z. Shindler; that of the fishes by Mr. J. H. Richard.

Besides the living reptiles referred to, quite a variety of species has been obtained from other sources, among others from Mr. Ober in his West Indian explorations. Dr. Ruth, U. S. N., the surgeon of the steamer Enterprise, in which Captain Selfridge made his exploration of the Am-

azon in 1848, also furnished a valuable collection from that river. From Dr. Hering was also received a collection of the species of Surinam.

Fishes.—As might naturally be expected, from the close connection of the operations of the United States Fish Commission with those of the Smithsonian Institution, the additions in this department have been especially noteworthy, and include not only various specimens of important scientific interest, but also many illustrating and attesting the propriety of national aid in the multiplication of useful food-fishes.

It is considered especially desirable to bring together in Washington a complete representation of the food-fishes of the United States, both inland and marine; and also such kinds from other countries as tend to illustrate the American species, or as may suggest future action in the way of their introduction and acclimation in the New World.

The series of species of the salmon family, contributed by Mr. Livingston Stone from the salmon-hatching establishment on the McCloud River, in the Upper Sacramento Valley; and those furnished by Mr. Charles G. Atkins, from his works in Bucksport and Grand Lake Stream in Maine, have constituted the most important additions of fresh-water species; while the special labors of the United States Fish Commission at Gloucester, Massachusetts, aided by the fishermen of that place, have brought to light nearly 20 forms of deep-sea fishes, previously unknown.

Next to the collections from the station of the United States Fish Commission at Gloucester, the most important additions to the marine fishes have been received from Mr. Vinal N. Edwards, for a long time an employé of the Commission, and stationed at Wood's Holl, whose vigilant attention to the subject brought to light a number of additional species, so that now the Wood's Holl record embraces nearly 140 different kinds.

From Mr. Silas Stearns, of Pensacola, while connected with the Pensacola Ice Company; from Mr. James C. Leslie, of Charleston; from Mr. Samuel Powel, of Newport; from Dr. Porter, U. S. A., and Mr. Moore, of the Tortugas, have come many additions to our knowledge of the distribution of species, through their contributions to the National Museum.

The Museum is also indebted in a very marked degree, as for many years past, to the services of Mr. E. G. Blackford, the well-known fish dealer of Fulton Market, New York, for the transmission of many valuable specimens. By an arrangement with the wholesale dealers and the fishermen, this gentleman is always notified of the appearance in the market of specimens that are believed to have an interest, either from their novelty or any other cause, and, in the exercise of an excellent judgment, whatever is thought will be valued in Washington is promptly transmitted to the National Museum. To no other single person is the Institution indebted for so many favors in this direction as to Mr. Blackford.

From the museum of the Wesleyan University, at Middletown, have been received a considerable number of fishes, collected in the Bermudas by Mr. G. Brown Goode; from Professor Felipe Poey also a number of

Cuban fishes, which have an especial value, as being types of his proposed memoir on the subject, which, should it appear on the scale contemplated, will be the most extensive work ever published on the fishes of any country.

From the west coast of the United States the most important additions have been of the fishes of Alaska, sent by Mr. E. W. Nelson, from Saint Michaels, and those of Puget Sound, by Mr. James G. Swan.

In the collection of fishes gathered in Cumberland Gulf by Mr. L. Kumlien, while connected with the Howgate Expedition, were several of kinds new to the fauna of northeastern North America, and others of great value as illustrating the species obtained by the United States Fish Commission at Gloucester, either by its own efforts or by the aid of the fleet of fishermen belonging to that port.

The Natural History Museum of Paris has contributed a series of the fishes of France and the Mediterranean. A series of the fresh-water fishes of Northern Siberia has been furnished by Dr. Otto Finsch as the result of his recent well-known explorations.

Among the more noticeable results of recent efforts to extend and increase the useful food-fishes of the United States, that have come to hand, are specimens of full-grown shad from the Sacramento River, contributed by Mr. Thomas Bassett; a pair of shad from the Ohio, by Mr. William Griffith, of Kentucky; a mature salmon from the Connecticut River, obtained through Mr. E. G. Blackford; one from the Delaware, weighing 23 pounds, presented by Mr. E. J. Anderson, Fish Commissioner of New Jersey; and one of 19 pounds, taken in the Susquehanna, by Mr. Frank Farr near the shad-hatching station of the United States Fish Commission, five miles below the railroad bridge at Havre de Grace. In addition to these, many specimens of young California salmon and of landlocked salmon have also come to hand.

Invertebrates.—In the department of invertebrates the collections have been largely confined to the marine species, especially as no particular effort is now made to gather the insects which form the great body of terrestrial forms. By an arrangement between the Smithsonian Institution and the Department of Agriculture, all the collections in the line of insects and terrestrial articulates generally are transferred to the care of that department, where, under the supervision of its entomologist, they are likely to render excellent service.

Of land and fresh-water mollusca quite a number of specimens have been received and properly cared for. Of marine invertebrata most gatherings have been secured, especially through the efforts of the United States Fish Commission, at Gloucester, the labor being performed under the special direction of Prof. A. E. Verrill, of Yale College, assisted by Messrs. Richard Rathbun and Warren J. Upham. In this service, however, the work connected with the collection and arrangement of the marine mollusca was under the direction of Mr. Sanderson Smith, of New York, a competent conchologist, the value of whose

gratuitous services to the Fish Commission and to the Smithsonian Institution is not easily to be overestimated.

With the assistance of the extensive and powerful apparatus on board the Speedwell vast numbers of specimens of all kinds were secured, appropriately assorted, and packed by the gentlemen referred to, and are now in charge of Professor Verrill at New Haven undergoing the necessary examination for their arrangement and identification. A great number of duplicates was obtained for the purpose of supplying sets to educational and scientific institutions throughout the country.

A collection of fossiliferous rocks, brought up from time to time by the trawls from the various banks of the New England coast, and found in the possession of various citizens of Gloucester, by Mr. Warren J. Upham, while connected with the Commission, revealed, under the critical labors of Professor Verrill, Mr. Smith, and himself, the existence of a submarine formation quite different from any now known on the land, and embracing a number of new species, and others in peculiar combinations. The idea has been suggested by Professor Verrill that at some earlier day the whole or the greater part of the interval between North America and Europe, extending possibly as far north as Iceland, was occupied by a continent, which, after a certain amount of erosion and excavation, was submerged, the plateaus or highest remaining portions constituting a portion of the banks, which furnish such rich harvests. The indications of this deposit are believed to be found at Gay Head on Martha's Vineyard, and possibly at Siasconset in Nantucket, in the Georges, at Le Have and Quero Banks, the Grand Banks, Flemish Cap, &c. Of course so important a generalization will require further determinations, and it is hoped that the labors of the Fish Commission during the coming year may tend to solve the problem.

In the collections made by the several methods, and from the several sources referred to, are to be found all the orders and classes of marine invertebrata, such as radiates, mollusks, worms, crustacea, &c.

Apart from the collections of shells and of invertebrates referred to, we may mention a valuable collection of shells of Florida, presented by the Chicago Academy of Sciences, and of those of the German seas, by Professor Möbius.

Of terrestrial fossil remains from the land no important additions have been made. Among those received, however, there is an interesting and valuable collection of species from California, presented by Hon. A. A. Sargent, United States Senator from that State, and a Regent of the Smithsonian Institution.

Reference has been made to the arrangement with the Department of Agriculture, by which that establishment receives all the collections of land articulates; and a similar arrangement has been made in regard to the plants, special efforts in regard to that branch of natural history being left to the department. All the specimens offered spontaneously or collected by government expeditions have been turned over

to the department as soon as received. The most important of these consist of a series of species from Japan and Asia, presented by the Botanic Garden of St. Petersburg. Professor Sargent, of the Botanic Garden at Cambridge, has contributed quite a number of valuable living aquatic plants for the purpose of embellishing the United States carp-ponds on the Monument lot in this city, and of furnishing desirable food for the herbivorous fish.

Dr. William G. Farlow, of Cambridge, while associated with the Fish Commission at Gloucester, made a large collection of marine algæ, of which, as heretofore, a part will be presented to the National Museum.

A circular issued by the Institution some years ago, relative to the habits, &c., of the grasshopper and other insects, elicited many responses, which were referred to Prof. S. H. Scudder. The material, however, was never fully worked up, and it has been transferred, with the consent of the Institution, by Professor Scudder, to the United States Entomological Commission lately organized by Congress.

I have thus furnished as briefly as possible a review of some of the more important contributions to the National Museum, but as the limit of space has prevented my going into much detail, I have been obliged to make selections from large numbers of contributions of value fully equal to those specially noted. All these, as stated, will be found in the list of donations entered in the record-books of the Institution. Every specimen received has, as far as possible, been recorded in its proper register, with a number affixed in some irremovable form; and whenever the size of the specimen would admit, with the name of the locality and of the donor attached. Of these entries no less than 9,973 have been made during the year, as shown by the table at the end of this Report. As heretofore explained, however, one entry may embrace a large number of specimens, especially of the same general character, without any special individuality, gathered at the same date, in the same locality, and received from the same person. It may fairly be assumed that the total number of pieces actually recorded and provided with numbers amounts to 15,000.

Considered with reference to geographical distribution—illustrating the several faunas of the various quarters of the globe, as would naturally be expected, by far the greater portion of these accessions has been received from North America, the regions from which the most important materials have been derived being Alaska, furnished by Mr. Nelson, Arctic America, by Mr. Kumlien, and the eastern coast of New England by the Fish Commission itself and its friends at Gloucester; of fishes and invertebrates from Puget Sound by Mr. Swan, fishes of the Upper Sacramento by Mr. Stone, fishes of Florida by Mr. Stearns, Dr. Porter, and Mr. Moore; and general collections by Mr. Ridgway, are among the most noteworthy.

From South America were received ethnological specimens from Peru,

by Mr. W. W. Evans; fishes and reptiles from the Amazon, by Dr. Ruth, U. S. N., of the United States steamer Enterprise.

From Mexico valuable specimens have been received from Professor Dugés, consisting especially of mammals, birds, reptiles, and fishes; illustrations of the ethnology and zoology of Guatemala have been furnished by Dr. Flint and United States Minister Williamson.

Of the animals of Surinam, collections were sent by Dr. Hering; of the vertebrata of Costa Rica, generally in a large variety, by Mr. J. Zeledon; of the fishes of Cuba, by Professor Poey; general collections from various islands of the West Indies, by Mr. Ober; fishes of Bermuda, by the Wesleyan University, of Middletown, collected by Mr. Goode; fishes and archæological remains from Japan, by Prof. E. S. Morse; the fishes of France and the Mediterranean, by the Museum of Natural History, Paris; of Northern Siberia, by Dr. Finsch, of Bremen; skins, skulls, and heads of the mammals of India, by the Public Library of Kurrachee.

Mineralogy.—In the department of mineralogy and geology, as usual, additions of many specimens, including several large collections, have been received, as it has now become quite a common thing for people all over the United States to send samples by mail or otherwise to the Institution for determination.

Many valuable additions have been made by the officers of the Land Department of the Interior, especially by Mr. John Wasson, surveyor-general of Arizona, and Mr. Hardenberg, the surveyor-general of California. By far the most noteworthy and important addition in this line, has been that of the greater part of the Swedish exhibit of iron, steel, and other metals, made at Philadelphia in 1876. The valuable iron and steel exhibit by the Swedish Commission at the Centennial Exposition had in part been promised to the American Institute of Mining Engineers, and at its solicitation any effort on the part of the Smithsonian Institution to secure the remainder for the government was waived in its behalf. It appears, however, that the necessary arrangements for their acquiring this collection were not completed, and during the year 1878, Dr. Joshua Lindahl, the representative of Sweden in connection with the Permanent Exhibition, offered the remainder of the collection as it stood, to the National Museum. This proposition was, of course, very gladly accepted, and the collection was duly transmitted under the direction of Mr. Thomas Donaldson, including the greater part of the display of the Iron and Steel Mining Company of Motala, and the iron and steel of Sandvik, a well-known and conspicuous Swedish establishment.

The institution received also, on special deposit, through the aid of Dr. Lindahl, the immense mass of native iron, weighing five tons, the smallest of three nuggets brought from the island of Disco by the Swedish Government, the one referred to having been presented to Professor Nordenskjöld, who had charge of the transfer, and by him sent for exhi-

bition to Philadelphia. Opinions of experts are at present divided as to whether this is actually of meteoric origin, or a representative of almost the single instance of metallic iron in considerable masses, as a native metal. Whatever be the actual fact, it makes no difference in the interest of the specimen; and its acquisition, even for a short time, by the National Museum, is a subject of congratulation.

Scientific investigation of collections.—As in previous years the collections of the National Museum, in charge of the Smithsonian Institution, have been freely open to the examination of competent investigators. It is preferred, of course, that this work be prosecuted in Washington; but where it is impossible to do this there is no hesitation in sending articles or collections, under suitable conditions, to any part of the world.

Most of this work of investigation is done by the resident naturalists connected with the Smithsonian Institution, directly or indirectly—the mammals by Professor Gill and Dr. Coues; the birds by Mr. Robert Ridgway; the reptiles by Dr. H. C. Yarrow and Dr. Bean; the fishes by Professor Gill, Mr. Goode, and Dr. Bean; the mollusks and marine invertebrates by Mr. William H. Dall; the insects by Professor Riley; the fossils by Prof. Charles A. White; the minerals by Dr. F. M. Endlich; the plants by Dr. Geo. Vasey.

Outside of Washington the principal collaborators have been, for the mammals, Mr. E. D. Alston, London, and Mr. J. A. Allen, of the Museum of Comparative Zoology, Cambridge, Mass.; for the birds, Mr. George N. Lawrence, of New York, Dr. P. L. Sclater, of London, and Mr. Osbert Salvin, of Cambridge, England; for reptiles and vertebrate fossils, Prof. E. D. Cope, of Philadelphia. These gentlemen have all rendered more or less service in this connection by investigating the specimens, identifying those that were previously known, and describing the new species.

Distribution of collections.—The extent of the distribution of specimens during 1878 will be seen by reference to the table at the end of this report. It has been quite large, and has furnished much educational and scientific material. It is expected, however, that a very much larger amount will be supplied during the year 1879. There is a great number of duplicates of minerals, rocks, fossils, &c., which cannot be reached until the liberality of Congress shall appropriate the necessary means to erect the new building for the National Museum. Such building is required even for the unpacking of the specimens and the separation of the series to be reserved for permanent display. This will leave a large quantity of surplus material, of considerable variety, which will enable the Institution to supply to a good degree the wants and applications of many colleges, academies, and scientific societies throughout the country.

GALLERY OF ART.

The principle of co-operation and not of competition which has for so many years been the basis of action of the Smithsonian Institution, finds

a portion of its expression in the arrangement with the Corcoran Art Gallery. Its pictures, statuary, and engravings have for the most part been removed to the Gallery, and the remainder is being prepared for the same destination. They are not presented to the Gallery, but simply deposited, and are subject to reclamation at any time.

For many years Professor Henry was one of the trustees of the Corcoran Gallery, and was thus able to look after the interest of the Institution in its collections. I have been honored by receiving a similar appointment at the hands of the board of trustees.

The propriety of the action of the Board of Regents in directing that a first-class portrait of Professor Henry be painted, the work being executed in April, 1877, by Mr. Le Clear, of New York, has been fully justified. His picture is now exhibited in the Regent's room in the Institution, after having been displayed for a time at the Corcoran Gallery. Several excellent crayon heads, of life size, of Professor Henry have been executed by Mr. Ulke and copies have been ordered for Princeton College and other institutions where Professor Henry's was an honored name.

UNITED STATES FISH COMMISSION.

Attention has been called in the reports of my lamented predecessor to the extent to which the time of the officers of the Smithsonian Institution has been occupied in the prosecution of labors undertaken by direction and in behalf of the general government; his own record of twenty-six years' service in connection with the Light-House Board, for a large portion of the time its chairman: his service on various special boards, such as those for the selection of building-stones for the Capitol, for the consideration of the question of ventilation of the Hall of the House of Representatives, &c., and in many other cases, furnishing ample illustration.

My own more immediate relations to the general government commenced in 1871, when Congress passed an act authorizing the appointment of a Commissioner of Fish and Fisheries, to investigate questions connected with the condition of the fisheries of the sea-coast and the lakes, and providing that the appointment should be by the President and confirmed by the Senate, and that his services should be rendered without compensation.

Having received the appointment from the President, I commenced the work by an investigation, of several months' duration, of the condition of the fisheries on the New England coast, especially as to the supposed conditions affecting their extent and development.

In 1872 the subject of the propagation of food-fishes in the waters of the United States was added by Congress to the other duties of the Commissioner, and since then his time has been largely occupied with the prosecution of researches into the American fisheries and in the propagation and distribution of various desirable species into every State in the Union. Previous reports will be found to contain general statements

of what has been done each year; and I shall therefore give a brief account of what was done in 1878, premising that the appropriations, beginning with $5,000 in 1871, have increased with each year, until those for 1878 amounted to $78,200.

The work of the Fish Commissioner is now prosecuted under the two distinct heads of inquiry, and propagation, each with a corps of assistants, for the most part occupied in different regions of the country. The propagation department has special reference to the shad, the salmon of California, the salmon of Maine, the land-locked salmon, the white-fish, and the carp.

The invention of apparatus by Mr. T. B. Ferguson, one of the fish commissioners of Maryland, by which the hatching of shad could be prosecuted on a much larger scale than before, and under more convenient circumstances, marks a new era in the art of fish culture, experiments made by him in 1877 having been extensively prosecuted by the United States Fish Commission in 1878.

For the purpose in question four scows were fitted up in Baltimore, two with suitable machinery and apparatus, and two as quarters for the men. These were taken to Albemarle Sound and established at a point on the fishery of Dr. Capehart, of Avoca, by whom every assistance was rendered in the supply of ripe fish, from which 10,000,000 of young fish were hatched out and deposited in adjacent waters or transferred to distant points.

After the season for work in that vicinity had passed, the vessels were taken to Havre de Grace and anchored about five miles below the railroad bridge, in a sheltered cove. Here a much larger number of fish was hatched out, and the young were distributed by special messengers throughout the Union. The work of distribution of the young shad was under the special supervision of Mr. James W. Milner, first assistant of the commission; Mr. T. B. Ferguson, fish commissioner of Maryland, the inventor and constructor of the hatching apparatus, however, having charge of the propagation of the shad here, as also during the greater part of the sojourn at Avoca.

The result of the new experiment was perfectly satisfactory, and so far as relates to the shad in the future, there is no limit to the amount of work that can be done other than that of the number of ripe eggs procurable.

The labor of obtaining the eggs of the California salmon at the United States hatching-station on the McCloud River, in the Upper Sacramento Valley, was also carried on on a much larger scale than ever before, it being possible, as the direct result of the propagation in the earlier part of the operations of the commission, under the charge of Mr. Livingston Stone, to procure as many eggs as were called for; and no less than 15,000,000 eggs were obtained, and partly developed, and then distributed to various State commissioners and other parties, by whom they were hatched out and planted in the waters. A large num-

ber was hatched on account of the United States Fish Commission by Mr. Frank N. Clark, of Northville, Mich., and by Mr. Ferguson, at Baltimore. These were distributed to such of the Southern and Western States as were without arrangements of their own for prosecuting the work.

Nothing was done with the eastern salmon; but the favorable results of the work initiated five or six years ago, in restoring this fish in large numbers to the Merrimack and the Connecticut, and in planting them in the Delaware and the Susquehanna, will probably induce the renewal of the station at Bucksport, Maine, during the coming year.

The operations connected with securing eggs of the land-locked salmon at Grand Lake Stream were entirely successful, although not so many were obtained as last year. These are now in process of incubation, and will shortly be distributed.

Congress appropriated a sum of money for the purpose of fitting up the two lakes in the vicinity of the Monument in the city of Washington for the culture of European carp, a considerable number of the best varieties having been obtained in 1877, and deposited with the kind permission of the Park Commissioners in the ponds of Druid Hill Park, in Baltimore. When the Monument lot ponds were in proper condition a portion of the fish were transferred from Baltimore to their new quarters, where it is hoped they will find a congenial home. A distribution of the young will probably be made in the course of 1879, enough, it is hoped, to meet a part, at least, of the demand which has already sprung up for supplying fish-ponds throughout the country.

The most important progress in practical fish culture has been made by the United States Fish Commission during the year, in the application of its methods to the production of the sea-fishes. Experiments were instituted at Gloucester, in Massachusetts, in reference to cod, the spawning season of which takes place in the winter. The establishment was properly fitted up and, after varying results, the proper method of developing them was ascertained. Many millions of the young fish were hatched out and deposited in the waters, and about 20,000 sent on to Washington for exhibition to members of Congress, and others interested in the experiment. Nothing has yet been done with mackerel, but it is believed that the arrangements prepared for the cod will be equally efficient for that fish, as also, probably, for the halibut, while many other species, such as the tautog, sea-bass, and scup, can be treated in the same way.

The importance of this new departure of the United States Fish Commission cannot be overestimated, as it gives us the means of improving, at small expense, the sea fisheries of our coast, and also furnishes the opportunity of establishing them at points where they do not at present exist. Thus, by carrying the young cod from Massachusetts and planting them on the coast of New Jersey or Maryland, of Virginia or North Carolina, there is every assurance that, in accordance with the univer-

sal rule, these fish, when ready to spawn, will return to their starting place and become the means of establishing profitable fisheries to the inhabitants of the region. It is well known that in the Southern States the fisheries, contrary to the fact in the Northern States, are of little moment in the winter season, the most prominent species coming up in the spring and returning as the waters become chilly. The establishment of cod fisheries, and possibly of those of halibut, as winter fisheries along the southern coast, will therefore be of great importance.

The second branch of the Fish Commission's work, namely, that of the investigation of the sea fisheries, was carried on at Gloucester for three months, with the co-operation as heretofore of the Secretary of the Navy in furnishing a suitable vessel, and the general work was done with more efficiency and completeness. The same vessel, the United States steamer Speedwell, used in 1877, was detailed by the Secretary for the service, and was in command of Capt. L. A. Beardslee, who had previously sustained similar relations to the Commission when in charge of the steamer Blue Light.

The longer period of service of the vessel and the more favorable station enabled the Commission to perform a very large amount of work, the results greatly exceeding those of any previous year. Important determinations were made of the character of the sea-bottom, of the temperature and chemical constituents of the sea-water at different depths, the currents, &c., while the exhaustive collections of marine animals and plants showed clearly the character of the food of the fishes, and at the same time furnished a vast amount of natural history material of the greatest scientific interest. As heretofore, special efforts were made to obtain a large number of duplicates, so that by their distribution in named sets the colleges and other educational establishments of the country might participate in the results of the labors of the Commission.

As heretofore, the labors of the Commission at Gloucester, connected with the invertebrate department, were in charge of Prof. A. E. Verrill, of Yale College, New Haven, assisted by Mr. Sanderson Smith in the department of the mollusca, and by Mr. Richard Rathbun and Mr. Warren J. Upham. The collections made, as in previous years, were placed in the hands of Professor Verrill, who is now engaged in their classification and arrangement in sets. Dr. William G. Farlow, of Cambridge, as usual, spent considerable time with the Commission, and devoted himself especially to the investigation of the marine algae.

The investigation into and classification of the various kinds of fish brought in were in charge of Mr. G. Brown Goode, a collaborator of the National Museum, assisted by Dr. T. H. Bean, of the same establishment, and by Mr. R. E. Earll.

Capt. H. C. Chester had general charge of the laboratory and the direction of the actual dredging and trawling on the steamer.

The special superintendence of the hatching of the codfish was con-

ducted by Mr. J. W. Milner, with the assistance of Mr. R. E. Earll. The propagation department was in charge of Mr. Frank N. Clark, of Michigan. The machinery was superintended' by Capt. H. C. Chester, and it is to his ingenuity that we owe the construction of the apparatus by which the actual work of hatching the codfish was rendered practicable. The difficulty of using the apparatus employed for hatching shad arose from the fact that while the eggs of the shad are heavier than the fresh water, those of the cod are lighter than the salt water, and new conditions had to be devised to keep the eggs down instead of lifting them up. This problem, as already stated, was satisfactorily solved, after many experiments, by Captain Chester, who is therefore entitled to much credit for the success of the work.

HALIFAX COMMISSION.

In 1871 a convention was held by the United States and Great Britain, at Washington, for the purpose of settling certain questions at issue between the two governments, notably that of the depredations upon American commerce by Confederate cruisers, fitted out or supplied in British ports; and also certain disputed points in reference to the fisheries of British North America.

The treaty agreed upon was not ratified by the several contracting parties, consisting of the United States and the five British maritime provinces, until 1873, when commissioners were duly appointed by the respective governments, Mr. Alexander T. Galt being named by Great Britain; Governor Clifford, of New Bedford, by the United States, and Mr. Maurice Delfosse, the Belgian minister to the United States, as the third. For various reasons, and partly owing to the death of Governor Clifford, no definite action was taken until 1876, when Mr. E. H. Kellogg, of Pittsfield, Mass., was appointed to succeed Governor Clifford; and the place of meeting was fixed at Halifax, Nova Scotia, on the 15th of June, 1877, and after receiving the British claim the commission adjourned until the 28th day of July, 1877, when it reassembled and continued in session until nearly the stipulated limit, in the month of November.

The United States commissioner was assisted by Mr. Richard Henry Dana and Mr. William H. Trescott. The British commissioner had, as his counsel, one distinguished gentleman from each province, namely, Mr. Joseph Doutre, for Canada; Mr. S. R. Thomson, for New Brunswick; Hon. W. V. Whiteway, for Newfoundland; Hon. Louis H. Davies, for Prince Edward Island; and Mr. R. L. Weatherbe, for Nova Scotia.

At the request of the Secretary of State, I attended the meeting at as early a date as my other duties would permit, arriving on the 17th of August, and remaining until the 21st of October.

The British commission had on its side the minister of marine, Mr. A. Smith, assisted by Mr. W. F. Whitcher, the commissioner of fisheries.

The deliberations of the court involved a careful consideration of all

the facts and statistics of the two countries, and a vast amount of information relating to the subject was brought together in the form of testimony of witnesses and experts and by the presentation of tables, reports, and digests. The volumes of the reports of the proceedings of the commission constitute a rich field for the naturalist as well as the statistician.

Material service was rendered by the United States Fish Commission, in the collection of important statistics gathered expressly for the purpose, especially in the presentation of tables, showing the catch of fresh fish along the coast of the United States within the treaty limits. This work was more particularly under the charge of Mr. G. Brown Goode, who executed it to the entire satisfaction of the American counsel.

The occasion was made use of by me to collect information and to prepare a systematic account of what is known of the habits of the cod and mackerel, and the various methods of capturing them, the bait to be used, &c., which will form the subject of special reports hereafter.

The award of five and a half millions of dollars, as representing the value to Great Britain of the privileges conceded to the United States, has given very great dissatisfaction in this country, to the New England fishermen especially, who denounce it as unjust in the highest degree, and express the hope that at the earliest possible moment the treaty will be abandoned, even if the original condition of things be restored.

The very great lack of published information on the subject of the American fisheries, as compared with the extremely methodical and precise summaries of the Canadian authorities, has induced me to give especial attention to this subject for information in the future, and with the co-operation of the State Department, which has placed a small fund at my disposal for the purpose, I am engaged in collecting, collating, and digesting the facts and statistics in reference to the American fisheries, an information doubtless of much value on the occasion of another arbitration similar to that at Halifax. This work is more particularly in charge of Mr. Goode.

To ascertain the accuracy of the figures presented at the Halifax convention as to the catch by citizens of the United States of mackerel off the American and Canadian coast, I employed Mr. Alexander Starbuck, of Waltham, Mass., to make a new digest of the records, as shown by the State inspections of Maine, New Hampshire, and Massachusetts. His work has been completed and shows a material difference from the old figures, but without affecting the strength of the American case.

Statistics of sea fisheries.—Reference has already been made to the data relative to this subject at Halifax, and the intention on the part of the commission to secure reliable records of the catch, export, and consumption in the United States of the more important fish. For this purpose circulars were issued, requesting answers to certain questions relating to the habits, mode of capture, statistics, and disposition of the cod, the

mackerel, the mullet, the alewife, and the smelt. Also another blank inviting information as to the extent of the fishery marine, the nature of the crews, the tonnage of the vessels, the apparatus used for capture, and other incidentals. For the purpose of collecting this information, Mr. Vinal Edwards, of Wood's Holl, an assistant of the commission, was detailed to visit the fishermen along Buzzard's Bay and Vineyard Sound and obtain the data which were needed for the various purposes referred to. This was found to supplement very satisfactorily the valuable body of statistics now being collected under the direction of the commissioners of inland fisheries of Massachusetts. These gentlemen have been authorized by the legislature to require a report of the statistics in regard to the character and catch of all the pounds, weirs, and gill-nets in the commonwealth.

The results of these several circulars will be published in full in future volumes of the report, and I take great pleasure in referring to the first of the series—namely, that upon menhaden, as prepared by Mr. Goode. This is a most exhaustive and complete history of the subject in all its relationships, scientific, biological, and economical. It occupies 520 pages, and is illustrated by 30 plates. It forms one of the same series with the exhaustive paper by Mr. Starbuck upon the whale fisheries, published in the fourth volume of the reports of the Commission.

It is also proposed to direct special attention to the history of the Southern mullet. This fish in many respects represents and may be said to replace in the South the mackerel in the North. It occurs in enormous numbers, indeed such as to permit its capture in even larger quantities than the mackerel, coming in shore to spawn in immense numbers in the autumn months. It is not at all improbable that a catch of half a million barrels could easily be made, and under circumstances involving very much less expense and exposure than would be needed for taking one-quarter that number of mackerel. It is caught abundantly all the way from North Carolina southward into the Gulf of Mexico, and is destined at no distant day to represent a very important element in the resources and business of the South. At present the methods of taking and curing the fish are very inferior to those practiced in regard to the mackerel, and the fish is consequently less esteemed; but it is not improbable that in time it will be found to occupy an almost equal rank as a food-fish, and a much more important one as an article of commerce.

Another subject to which the attention of the Commission is being directed is a similar inquiry in regard to the lake herring, the whitefish, and the salmon trout, all of them species captured and cured in great quantities, and dividing with the mackerel and the cod the demand of the market.

MISCELLANEOUS.

Mr. William H. Dall, for many years an associate of the Institution, in charge of its department of conchology and marine invertebrates gen-

erally, spent several months in 1878 in a visit to Europe, especially to the zoological museums and to the co-workers in his special department of research in Northern Europe. Acting as an accredited agent of the Smithsonian Institution, he was authorized to offer its services to specialists in prosecuting their researches, and to invite exchanges of books and specimens. Many valuable alliances have been formed in consequence of this visit, and the Institution has had already the pleasure of supplying considerable material in response to calls for the same.

Availing ourselves of a visit to France in 1878, by Mr. Thomas Donaldson, whose services to the Institution during the Centennial Exhibition had been of great value, that gentleman was requested to call on Mons. de la Batut, who had presented the Institution with relics of James Smithson, and procure from him all the information he could furnish relative to the founder of this Institution. Mr. de la Batut is the half-brother of the nephew of Smithson, to whom the latter bequeathed his property, and in case of whose death it was to be devoted to founding the Smithsonian Institution. Mr. Donaldson visited Mr. de la Batut, and gathered from him a few facts of interest relative to Smithson, none of which, however, were entirely new. He also procured the following articles:

1. An engraved portrait of Hugh Percy, Duke of Northumberland, father of James Smithson and of Col. Henry Louis Dickinson.

2. A portrait of Henry James Dickinson, son of Col. Henry Louis Dickinson, the nephew and heir of Smithson. (Silhoutte profile.)

3. A paper in the handwriting of James Smithson, a copy of an article by an admiral on the cause of a shipwreck in the English channel.

4. An inventory of the personal effects of James Smithson at the period of his death, made by the British consul at Genoa.

5. An engraved visiting card bearing the inscription: "Henri de la Batut, Hotel Britannique, rue Louis le Grand, 20."

6. Copy in wax of the seal of the de la Batut family.

In addition to its irreparable loss in the death of its late Secretary, the Institution has also to lament that of a number of valued correspondents. Among those to be first mentioned is Mr. Donald Gunn, of Winnipeg, Manitoba, a veteran correspondent of the Smithsonian Institution, one of the earliest of its meteorological observers, and one who for more than twenty years has been a constant contributor of information and collections relating to the natural history of the Northwest.

Mr. Gunn was a Scotchman by birth, and entered the service of the Hudson's Bay Company in 1813; but in 1823 resigned and established himself in the Selkirk settlement in the Red River country, where he was for a long time a successful instructor of youth, and ultimately was appointed one of the judges of the court of petty sessions, holding that position for more than twenty years. He was also a member of the first legislative council of Manitoba, in 1871.

As stated, the first connection of Mr. Gunn with the Smithsonian

Institution was that of a meteorological observer. His long-continued observations of the weather are among the most reliable of those within its archives. His contributions of objects of natural history were still more important, embracing, as they did, nearly every branch in the various classes of the animal and vegetable kingdoms, and numerous collections in archæology and ethnology. Few reports of the Institution since 1850 are without some reference to his services.

In 1866 he made a special exploration, in behalf of the Institution, of the region west of Lake Winnipeg, spending considerable time in the vicinity of Shoal Lake and Lake Manitoba, in the course of which he collected large numbers of skins and eggs of birds; among the latter, several previously entirely unknown in museums. Within a year correspondence was in progress with him in regard to the renewal of this exploration.

The death of Mr. Gunn took place in the month of December, at the age of 81. It is understood that he has left behind him a minutely detailed journal of his experiences, and his relations to the colony in which he lived for over fifty years, which will doubtless be published on account of its great historical value.

Hon. William McKinley, a valued correspondent of the Institution, who died on the 2d of May, 1878, was born in Abbeville District, South Carolina, in the year 1809; became a resident of Georgia in early life; was educated at Franklin College, now the University of Georgia, where he was graduated; entered the profession of law, served as a member of the Georgia legislature; removed to Milledgeville, Ga., where he spent the remainder of his long and useful life in the active and extensive practice of his profession. He sought relaxation in other pursuits at times, none of which were more pleasing to him than the ethnological researches connected with that region, so rich in antiquarian remains, in which his life was spent. He made, within the last few years, repeated contributions of aboriginal remains to the Smithsonian Institution, remarkable for their beauty and value. Mr. McKinley also contributed a valuable paper entitled "Mounds in Georgia" descriptive of aboriginal earthworks on the sea-coast, and of the celebrated Pyramid of Kolee Mokee in Early County, to the Smithsonian Report for 1872. Further additions of antiquities by Mr. McKinley are mentioned on page 82 of the Smithsonian Report of 1875; and at the time of his death, a still later collection was in his possession, destined for the Smithsonian Institution.

Respectfully submitted.

SPENCER F. BAIRD,
Secretary Smithsonian Institution.

WASHINGTON, *January*, 1879.

APPENDIX TO THE REPORT OF THE SECRETARY.

GOVERNMENT EXPLORATIONS AND SURVEYS IN 1878.

The following are brief accounts of the principal explorations of the government in 1878, from which specimens will be derived for increasing the collections of the National Museum. They are furnished by the several directors of the explorations:

THE WORK OF THE UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES UNDER THE DIRECTION OF PROF. F. V. HAYDEN DURING THE SEASON OF 1878.

The work of the survey was intrusted to four parties, viz: One for carrying on the primary triangulation; two parties for geologic and topographic work; and a party for special geologic studies and photography. These were so organized that in case of necessity they could be divided for special duty. The field headquarters of the survey was at Cheyenne, Wyo., and the outfits and animals were transported via the Union Pacific Railroad to their points of departure.

Geology.—Dr. Hayden, the geologist in charge, accompanied the photographic division, and the route pursued gave him an opportunity to secure a very accurate general knowledge of the geological structure of a large area. The Wind River Range proved one of remarkable interest. It has a trend about northwest and southeast, with a length of about 100 miles. On the west side all the sedimentary belts have been swept away, down to the Archæan, older than the Wahsatch, and the latter formation rests on the Archæan rocks all along the base of the range, seldom inclining more than 5° to 10°. On the east side of the range the seams of sedimentary formations usually known to occur in the northwest are exposed from the Potsdam sandstone, which rests upon the Archæan rocks, to the Cretaceous inclusive.

Along the northwestern portion of the range the Wahsatch Group only is seen for some distance, but as we proceed down the Wind River Valley the formations appear one after the other, until at the lower end the entire series is exposed. The Wind River Range may be regarded as originally a vast anticlinal, of which one side has been entirely denuded of the sedimentary, except the Middle Tertiary. On the same side of the range the morainal deposits and glaciated rocks are shown on a scale such as we have not known in any other portion of the West. Three genuine glaciers were discovered on the east base of Wind River and Frémont Peaks, the first known to exist east of the Pacific coast.

The morainal deposits are also found on a grand scale in the Snake River Valley, on the east side of the Teton Range. The numerous lakes have been the beds of glaciers, and the shores of the lakes are walled with morainal ridges. North of the Teton Mountains the prevailing rocks are of modern volcanic origin, and in the Yellowstone Park the hot springs and geysers are the later manifestations of the intense volcanic activity that once existed. All these interesting features were studied with care, and the results will be elaborated for the twelfth annual report of the survey.

Mr. W. H. Holmes acted as geologist to the second division. The first month of the season he was with the fourth division, which proceeded from Point of Rocks Station northward, along the west side of the Wind River Mountains, and up the Snake River Valley to the Yellowstone Park, where he joined the second division. In the mean time he was engaged in making sketches, panoramic views, and geological sections of the intermediate country, all of which will prove of the highest importance in illustrating the geological structure of this most interesting and complicated region.

The latter part of the summer was spent in making detailed geological examinations in the district that includes the National Park. The greater portion of the park was found to be covered with somewhat uniform flows of the ordinary volcanic rocks. Features of more than ordinary geologic interest occur, however, along the northern border of the park district. Here a small belt, not more than 15 by 30 miles in extent, contains a fair epitome of the geology of the Rocky Mountain region. The whole series of formations from the earliest to the most recent are almost typically developed. The only marked irregularity in the succession of geologic events occurred during the great mountain-building period of the early Tertiary. After that followed a number of inferior oscillations of the surface, during which an extensive series of recent Tertiary and volcanic rocks were deposited. Connecting this period with the present are the deposits of a number of great lakes, which at the present time have their chief representative in Yellowstone Lake.

The formations of the Tertiary period present features of more than ordinary interest. They consist of upward of 5,000 feet of strata which are almost totally made up of fragmentary volcanic products. The whole period seems to have been one of unparalleled volcanic activity, the latter part especially having yielded such immense quantities of ejecta that the strata are almost wholly breccias and conglomerates. These formations are therefore so unlike those of corresponding periods in neighboring provinces that it is almost impossible, considering the absence of both vertebrate and invertebrate remains, to make satisfactory correlations. This difficulty is increased by the fact that these formations have a much greater elevation than those of any of the neighboring basins of the interior or eastern plains districts. They lie in a horizontal position, upon the eroded surfaces of the strata of preceding ages, at an elevation of from 6,000 to 11,500 feet above the sea.

A very extraordinary feature of these rocks is the occurrence of silicified forests which are found *in situ* not only at one horizon but at a great number of horizons throughout a great part of the whole series. Fossil leaves found associated with the silicified forests near the middle of the series indicate the prevalence of a flora very closely related to that of the present time. They belong, according to Professor Lesquereux, to late Miocene or early Pliocene times.

Among the many points of interest in the way of flowed volcanic rocks was the discovery and examination of extensive deposits of obsidian. In one locality upwards of 600 feet of obsidian strata occur, much of which is solid glass; banded, spherulitic, and brecciated varieties are interbedded with the more solid layers. A very extensive collection of these and other volcanic rocks was made.

No workable beds of coal have been found within the park area, nor have any deposits of the precious metals been discovered.

To Dr. A. C. Peale and Mr. J. E. Mushbach was assigned the special investigation of the hot springs and geysers. Owing to the lateness of the season when the park was reached, and the early storms in September, there was comparatively little time for work. About two months were spent by them in mapping and investigating the springs in the Shoshone Basin, Upper and Lower Fire-Hole Basins, Red Mountain Basin, Gibbon's Fork Basin, the Mammoth Hot Springs, and the Mud Springs localities of the Yellowstone River.

Over 1,500 temperatures were recorded, and about 2,500 springs were mapped and notes taken for their description. Special attention was paid to the geysers and notes of their times of eruption and the heights reached by them were taken.

Two of the geyser basins were almost unknown before and had never been described. The Gibbon's Fork Basin presented many features of interest, among which were the numerous varieties of the siliceous deposits, many of them probably new to science. Water from important springs of the principal localities was brought in for future analysis. Notes were taken for mapping the different groups of springs on a large scale, so that hereafter they may enable the tourist to identify the individual springs. Many new geysers were discovered and new points of interest in relation to the old ones obtained.

Large collections of specimens were made and brought east.

The notes of this division of the survey being largely statistical, the complete results of the work cannot be detailed until they are thoroughly worked up.

The following is a summary, by Mr. O. St. John, of the geological work prosecuted in the field assigned to the Wind River division:

The region explored comprises a triangular area extending along the forty-third parallel from Salt River to the Wind River Valley, a distance of about 100 miles. The boundaries on either side converge, uniting near the parallel 43° 45′. It thus includes about half of the Wind River

Range and the continental water-shed north to Togwotee Pass, the Gros Ventre Mountains southeast of Jackson's Basin, and in the southwest the considerable area south of the Grand Cañon of the Snake filled by the southern prolongation of the Snake River Mountains, or what is here known as the Wyoming Range, in which latter quarter the work commenced.

The approach was from the south up the valley of Green River, which forms a considerable basin area in the southern central portion of the district, and which is entirely filled with deposits of the age of the Tertiary. These decline basinwards on the three sides hemmed by the Wyoming, Gros Ventre, and Wind River Mountains, attaining a thickness of several thousand feet.

The northern end of the Wyoming Range was here found to consist of several quite well defined low ridges which reach the maximum of ruggedness in the Carboniferous barrier ridge on the western border along Salt River. To the east of this belt Hoback's River rises in a basin area south of the Gros Ventre Range, which, geologically, is part of the Green River Basin, the water-divide being merely a low ridge composed of the soft arenaceous Tertiary beds. The latter are here unconformably uplifted on the border of the Hoback Cañon ridge, the easternmost of the Wyoming Range, and which is made up of Carboniferous and Mesozoic formations occupying a synclinal, either border of which appears in the monoclinal crests on the east and west sides of this ridge.

A tributary of the Hoback on the west of the cañon ridge flows through a valley which penetrates southwards nearly to the southern border of the district. In this vicinity the western crest of the Hoback Cañon ridge shows an anticlinal structure, the Carboniferous on the west flank being succeeded by the Trias, Jura, and Cretaceous, and finally a heavy series of sandstones and variegated arenaceous shales which probably pertain to the Laramie. The latter stretch across the valley, dipping westwardly, and impinge on the next west-lying mountain ridge, which is also composed of Carboniferous strata, abruptly tilted and faulted, with downthrow on the east. Inclining off the west slope of this ridge the same series of geological formations are met with as mentioned above, the later-formed showing subordinate folds and making up the bulk of the highland to the west which has been carved into a very broken belt by the erosion of the eastern tributaries of John Gray's River and the gorges descending to the Snake. Beyond this nearly the same stratigraphical and structural features recur in the more bulky ridge which occupies the interval extending over to Salt River, viz, westerly dipping Mesozoic and Post-Cretaceous deposits, impinging against the faulted Carboniferous in the ridge on the west.

In the latter region much information was gained relative to the identity in stratigraphical and structural elements that subsist here and in the cluster of mountains culminating in Mount Baird north of the Grand Cañon. The whole region here referred to proved to be exceed-

ingly rough, but with redeeming valley spaces abounding in good grazing, while the hills are quite well wooded with coniferous forests.

The southern flank of the Gros Ventre Mountains was traversed from a point near where the Hoback's Cañon ridge first approaches this range, thence east to the broad depression separating it from the northern portion of the Wind River Range. In the west the culminating peak rises into a bared Archæan cone, the primal rocks occurring at one or two points farther east, where they have been laid bare in the deeper cañons which all the streams penetrating the mountains from this side have excavated. But for the most part this mountain front is heavily plated with Palæozoic formations, including the Potsdam quartzite, Quebec limestones, the magnesian limestone, and the still heavier series of Carboniferous limestones and sandstones, which latter forms the mass of the eastern portion of the range over to the divide at the head of water flowing into Green River. The Palæozoic rocks have been uplifted into great folds, with abrupt inclination on the southerly flanks, contrasting with long declivities in the opposite direction, on which side the range loses much of its rugged, imposing character. Here and there patches of Mesozoic appear low in the south-side mountain flank, succeeded by the unconformable Tertiary beds descending into the Hoback and Green River Basins. In some of the larger cañon mouths interesting exhibitions of morainal and other glacial phenomena were first met with.

The work in the Wind River Mountains was commenced towards the northern end on the west side, and thence carried southwards, circumstances compelling a rapid march round via South Pass to Camp Brown, from which point the work was prosecuted northwards along the eastern flank of the range.

In the vicinity of Green River Cañon, on the west side of the Wind River Range for a few miles, the outer barrier of the mountains preserves a remnant of the Palæozoic formations. These deposits are very similar to the corresponding formations in the Gros Ventre Mountains, and identical with the much more extensive occurrence of strata of that era on the east side of the range. They have been lifted high up on the mountain with minor undulations, and, as seen from the open basin to the southwest, they have the appearance of curving round the extremity of the range. But the latter appearance was found to be deceptive, the Archæan soon reappearing in the outer slope to the north of Green River Cañon, and thence continuing until all the more ancient rock series is hidden by the Cenozoic and Post-Tertiary accumulations at the northern end of the range.

The brief visit paid to the summit of this portion of the Wind River Mountains afforded what is to the student of American geology a field of greatest interest in the existence here of living glaciers. The snow-fields were found to be much more extensive than was surmised from the distant views of the summit, and the ice-filled gorges, especially on

the east side at the sources of Torrey's Creek, presented most interesting examples of many of the associated phenomena connected with the glacier. But compared with their former extent these are but the merest vestiges of the ice masses which flowed down and polished the cañon-walls of all the drainage courses which penetrate the range, and in the amount of glaciation and the piled-up *débris* strewn along the sides of the debouching valleys something like an adequate conception of their former extent and comparatively recent dissipation may be formed.

A few miles south of the cañon of Green River the older sedimentaries have been entirely removed from the mountain border, the Tertiary coming in contact with the bared Archæan rocks. Such are the geologic features to the southern border of the district, and probably, indeed, throughout the west flank to the extreme southern terminus at South Pass.

The eastern flank of this range was found to possess a much more extensive area occupied by the Palæozoic formations, which, for the most part, are simply upraised, forming so many more or less well-marked inclined benches. The most recent of these is composed of the Carboniferous, preceded by the magnesian limestone, Quebec limestone, and primordial quartzites, which lithologically, and in the topographic features molded out of them, bear close resemblance to the west flank of the Téton Mountains. At no point were the Trias and later Mesozoic formations found rising to any considerable elevation on the mountain border; on the contrary their presence marks the boundary between the orographic and basin areas. The latter formations present in a general way typical lithologic features characterizing their occurrence in the region to the west, with however many and in some respects somewhat strongly contrasted local stratigraphic peculiarities. The "red beds" of the Trias exhibit enormous local accumulations of massive and laminated gypsum, and the Cretaceous here contains seams of coal which will become of economic value.

In the Wind River Basin the unconformable Tertiary occupies the interval reaching over to the Owl Creek Mountains to the northeast. The border of this basin along the foot of the Wind River Mountains presents some extraordinary spring deposits of very modern date in places incorporated with the gravel deposits occurring in terraces at the foot of the mountains. Many, perhaps the majority, of the spring sources have become extinct; but a few remain, evidently but feeble as compared with their former volume, but which have built up quite extensive deposits of calcareous tufa. Some of the older deposits present much the appearance of porous limestones forming extensive benches in the mountain's foot. The presence of these deposits in some of the cañons on this side of the mountains is associated with the most picturesque scenery. All the streams that rise high up in the mountains were formerly the beds of extensive glaciers which built up the great morainal ridges, like those which border the debouchures of the Little

Wind River, Bull Lake, Dinwiddie, and Torrey's Forks, only less extensive accumulations of glacial materials than those found along the west border of the range.

In the water-shed extending northward from the northern end of the Wind River Range extensive arenaceous deposits of modern-looking Tertiary age but slightly disturbed, are met with, and which evidently form uninterrupted connection with the Wind River Tertiaries on the one hand and the deposits which occupy so large area east of Jackson's Basin on the other. In the latter quarter, in the Mount Leidy highlands, and along the upper courses of the main tributaries of the Gros Ventre, in lower strata of the same series, extensive developments of lignite were met with, the special investigation of which was undertaken by Mr. Perry. In still more ancient horizons other lignitic seams were found which, together with those just mentioned, render this one of the most important coal-producing areas as yet discovered in this region.

In the latter region the lignitic and older mesozoic formations within a narrow belt at the northern foot of the Gros Ventre Mountains have been thrown into a series of sharp parallel folds. To the northeast the Tertiaries dip, with gradually slackening inclination, until they pass beneath the volcanic mantle in the vicinity of Togwotee Pass; on the opposite side the older Mesozoics as uniformly rise up on the flank of the Gros Ventre Mountains, whose northern crest reveals the regular courses of the Carboniferous limestone which in places preserves a coping of the Triassic "red beds."

During the last two months the expedition encountered much inclement weather, embarrassing the prosecution of the field-work; and on its arrival in the region of Mount Leidy and Buffalo Fork, about the middle of October, it was overtaken by the early snows of winter, which virtually closed the field-work for the season.

Paleontology.—So large an amount of paleontological material had accumulated during the previous years that its critical study became necessary for the purpose of aiding in the elucidation of certain problems in structural geology which had arisen in the prosecution of the field-work. Dr. C. A. White, paleontologist to the survey, therefore devoted the whole season of 1878 to this work at the office, instead of taking the field as he did the previous season. The work which thus engaged his attention embraces the preparation of a detailed report of his fieldwork for 1877, including the discussion of important questions connected with it, the preparation of a large number of new fossil invertebrates for publication and illustration, and the illustration of all the types of species in the collections of the survey which the late Mr. F. B. Meek had described, but not illustrated.

Besides the collections made by the various parties of the survey, others have from time to time been received from several persons not officially connected with it, from different parts of the western portion of the national domain. The investigation of these collections brings out

some interesting facts concerning the geographical distribution of types, especially those of marine Cretaceous invertebrates. Among the more interesting results of Dr. White's investigations is the recognition of a Triassic fauna in the rocks of Southeastern Idaho. This is of especial interest as being the first discovery of distinctively Triassic invertebrate types in the West, east of those now well known to exist in the Pacific coast region; and also on account of the close relationship of these types with those of the Middle Trias of Europe, while those of the Pacific coast represent the Upper Trias.

Primary triangulation.—The primary triangulation of 1878 was extended northward from that of 1877 which was begun at Rawlins, Wyo., where it connected with the system of triangulation of the survey of the fortieth parallel.

The triangulation party, in charge of Mr. A. D. Wilson, left the Union Pacific Railroad at Point of Rocks, Wyo., on July 28. They traveled northward to the western base of Wind River Range, where their work began. In this range two stations were made, on Wind River and Frémont's Peaks.

Traveling westward from the base of this range, they crossed the head of Green River Basin, and, threading the cañon of Hoback's River, they reached the Snake at the head of its cañon.

They followed this stream up to the eastern base of the Grand Téton, where, finding it impracticable to ascend this mountain from the east, they crossed to Pierre's Hole by way of the Téton Pass. From this, the west side, the peak was found to be more accessible, and Mr. Wilson succeeded in reaching, with his instruments, a secondary summit 100 to 200 feet lower than the main crest, and distant from it about 400 feet. He reported the true summit to be practically inaccessible.

From Pierre's Hole the party next went northwest to Sawtelle's Peak, near Henry's Lake, in Eastern Idaho. On the night following the ascent of this mountain, all the animals belonging to the party were stolen by Bannock Indians, leaving the party afoot, at least 100 miles from the nearest settlement.

After carefully caching their instruments, the party made their way on foot across arid plateaus to the Geyser Basins, where they met the parties of Messrs. Gannett and Jackson. With their aid, and the kind assistance of Mr. James Eccles, an English gentleman who, with a party of his own, was visiting the country, Mr. Wilson was again fitted out, his instruments having in the mean time been recovered, and his work went on with but little delay.

His next station was Mount Sheridan, the highest peak of the Red Mountains, in the southern part of the Yellowstone National Park. Thence he visited Electric Peak, near the northern boundary of the park, and the highest summit within its limits. The well-known Mount Washburn was his next station, and from that mountain he went southward, passing around Yellowstone Lake and up the Upper Yellowstone,

intending to make a station on a high peak of the Yellowstone Range, near the head of the latter stream. The snow, however, which had been accumulating for a month in that high mountain region, had become at that time (about the end of September) so deep that it was impossible to do any more work. Indeed, it had accumulated so in the passes about the heads of the Upper Yellowstone, Snake, and Wind Rivers, that the party found difficulty in getting their animals over them. Finally, however, the party reached the head of Wind River, and thence traveled to Rawlins, Wyo., on the Union Pacific Railroad, where they were disbanded.

Topography.—To the party in charge of Mr. Henry Gannett was intrusted the work of making a detailed survey of the Yellowstone Park, with extended study of the phenomena of the hot springs and geysers. Mr. W. H. Holmes was detailed as geologist of this division, while to Dr. A. C. Peale was intrusted the study of the hot springs and geysers, Mr. Gannett undertaking the secondary triangulation and topography of the park, and his assistant, Mr. J. E. Mushbach, the detailed survey of the geyser basins and other groups of springs.

The party left Granger Station, Wyo., on July 28; drove up Green River to the head of the basin; thence down the rugged defile of Hoback's River to the Snake, and up the Snake to its forks at the south boundary of the Yellowstone Park.

Turning westward at this point, they spent a few days in surveying Fall River and its affluents, then returned to the Shoshone Geyser Basin at the west end of Shoshone Lake. Here the party was joined by Mr. Holmes, who up to that time had accompanied Dr. Hayden in the Wind River and Téton Mountains.

Leaving the body of the party in permanent camp at the Shoshone Geyser Basin, Messrs. Holmes and Gannett visited the Red Mountains and the country south of Yellowstone Lake. On their return from this trip, which occupied a week, the party, re-enforced by that of Mr. Jackson, moved across the divide to the Upper Geyser Basin, near the head of the Madison (Fire Hole) River. Here Dr. Peale and Mr. Mushbach were left to carry on their work, while the party continued on down the Fire Hole River to the Lower Geyser Basin. Thence they crossed to the Yellowstone River via Howard's road, and continued down that river to the Mammoth Hot Springs on Gardiner's River, where the supplies for the season were stored.

Refitted with provisions, the party returned up the Yellowstone as far as the mouth of its east fork, which they ascended nearly to its head in the rugged Yellowstone Range; then crossed a high, rolling divide to Pelican Creek, a tributary to Yellowstone Lake. Following this stream down they reached Yellowstone Lake at its northeastern corner, skirted its eastern shore to its head, and traveled several miles up the Upper Yellowstone River; thence they returned to the foot of the lake and followed the river down to the Mammoth Hot Springs, arriving there about October first.

Starting a second time from the springs, the party traveled southward to the headwaters of Gardiner's River and Gibbon's Fork of the Fire Hole, following the road recently cut by Colonel Norris, superintendent of the Yellowstone National Park, from the Mammoth Springs to the Geyser Basins. Having completed their work in this direction, they spent a few days in studying the south end of the Gallatin Range, which separates the waters of the Yellowstone from those of the Gallatin, and then returned to the Mammoth Springs; whence, having been joined by Messrs. Peale and Mushbach, they went to Bozeman, Mont., where the party disbanded.

The above is a sketch of the route of travel of the party. From it the geologist and topographer branched off widely, thus covering the country between the routes of travel.

The area embraced in this survey is about 3,500 square miles, of which material for a map on a scale of one mile to an inch was secured. In prosecution of the work of secondary triangulation and topography 47 stations were made, from which 2,100 horizontal and 500 vertical angles were measured. Altogether 370 points were located, an average of 1 in 9½ square miles; 230 observations for height were made with the mercurial barometer, and 100 with the aneroid.

Material for maps in detail of all localities of special interest was collected. Among these may be mentioned the well-known Geyser Basins, on the Fire Hole, the Shoshone Geyser Basin, the fine group of springs at Heart Lake, and those on Gibbon's Fork discovered by Colonel Norris, the Mammoth Springs on Gardiner's River, the Mud Geysers on the Yellowstone, and others. The heights of all important waterfalls were determined by measurement with the tape-line, and thus the vexed question of the height of the Yellowstone Lower Falls was definitely settled.

The area occupied by the Yellowstone Park has a great elevation, ranging in the flat country from 6,500 feet to 9,000, while its mountain peaks reach heights of 11,000 feet. Its mean elevation is about 8,000 feet. Within this elevated region head three large rivers, the Madison and Yellowstone, which flow off northward to join the Missouri, and the Snake, or Lewis Fork of the Columbia, which at first has a southerly course. The greater part of the Park is a rolling plateau, broken here and there by small groups of mountains, as the Red Mountains and the Washburn Group. East of the Yellowstone River, separating its drainage from that of the Big Horn, is a high, rugged, volcanic range, whose peaks reach 11,000 to 12,000 feet. This range was, in 1871, named "Yellowstone Range" by Dr. Hayden.

Excepting a narrow belt in the northern part, this park is everywhere heavily timbered. Indeed, with the exception of Washington Territory and the western portion of Oregon, it is the most densely timbered area in the West. There is practically no arable land within its limits owing to its great altitude, and, except along its northern border, little open country suitable for pasturage.

The heavy growth of timber indicates and fosters a comparatively moist climate. The park is a region of lakes and swampy tracts, of springs, and abundant perennial streams. The summer season is short. While frosts may be expected any night in the year, the winter holds until June and commences again in September. July and August usually afford fine but cool weather, with cold nights; but September brings frost and snow.

The third division, under Mr. F. A. Clark, surveyed the Wind River Mountains, a portion of the Wyoming Range, the Gros Ventre Range, with a large area in the Snake River Valley. Mr. Clark made 31 gradienter stations and 15 compass stations. The area lies between latitude 43° and 44° and longitude 109° 15′ and 111°. This includes the upper portion of the Wind River Mountains, with portions of the Wyoming Range, the Gros Ventre Range, and portions of the Shoshone Mountains and the Owl Creek Range; also the sources of Green River, Hoback Basin, and upper waters of Wind River. Mr. St. John acted as geologist and Mr. N. W. Perry as mineralogist to this party. Their reports will prove of general interest. Mines of gold, silver, iron, and vast beds of gypsum, as well as many other minerals, were found.

Photography.—In the prosecution of the field-work of the survey during the past season a photographic division was again put in operation, after an interval of two years, under the leadership of Mr. W. H. Jackson, who has been connected with the survey as its photographer during the past nine years.

Leaving Point of Rocks, on the Union Pacific Railroad, on July 24, the first points of interest were reached on the western flank of the Wind River Mountains. Two side trips, undertaken in connection with Mr. Wilson, in charge of the primary triangulation, were made to the crest of the range, and some grand views of that remarkable region were obtained. From the summit of Frémont's Peak views were made of an immense glacier now occupying its eastern slope. Fine views were also obtained of the great glaciated plateau lying between the plains and the crest of the range.

Proceeding next to the vicinity of the Grand Tétons, lying to the east of the headwaters of the Snake River, several magnificent views of the remarkable range in which they occur were made from the neighborhood of Jackson's Lake.

Reaching Shoshone Lake the 18th of August, the entire month following was devoted exclusively to photographing the remarkable phenomena connected with the hot springs and geysers of the various basins within the Park. Especial attention was paid to the almost unknown but exceedingly interesting features of the new Shoshone and Red Mountain Basins. The "Fire Hole" and "Mammoth Hot Spring" Basins were again gone over, and the experience derived from the work done here in former years shows its benefits in the remarkably effective views obtained this season. At this latter basin many detailed as well as general views

were made with especial reference to the future production of an exact model in plaster of the whole group.

On the homeward route, which was by the way of the Upper Yellowstone, across the headwaters of the Snake to the Wind River and thence via Camp Brown to the railroad, a number of very effective views were made, particularly about the Grand Falls and the cañon of the Yellowstone. At the Yellowstone Lake some very fine views were made, but that region was not completed, in consequence of a prolonged snow-storm.

At the Togwotee Pass some characteristic views were obtained of the remarkable breccia mountains, whose castellated forms adorn that portion of the continental divide, and also some of the curious "bad lands" farther down on Wind River. The season's work closed at Camp Brown, where portraits and groups were made of the Bannock prisoners in confinement at that post.

A brief summing up of the season's operations of three months, much of which time was characterized by extremely inclement weather, shows an increase to the already very extensive collection of the survey, of 45 negatives 11 by 14 inches in size, and 110 of smaller ones, 5 by 8.

PUBLICATIONS.—During the year 1878 the publications of the United States Geological Survey have been numerous and important, yielding in no respect to those of any previous year, and fully sustaining the reputation this organization has acquired for the prompt and full exhibit of its operations. Eleven separate publications have appeared and others have been brought to a forward state of preparation.

Perhaps the most important of these as a contribution to pure science is the seventh volume of the quarto reports. This is Prof. Leo Lesquereux's beautiful monograph, "The Tertiary Flora," forming a companion volume to the same author's "Cretaceous Flora," which latter constitutes the sixth volume of the series. It consists of nearly 400 pages, and is illustrated with 65 plates.

A further contribution to the fossil flora of the West has been made in the publication of 26 plates, entitled "Illustrations of the Cretaceous and Tertiary Plants of the Western Territories of the United States" This volume consists only of the plates and explanatory text, the full report upon the subject being deferred.

The regular annual report of progress for the year 1876, being the tenth of this series, appeared during the past year. This makes a volume of about 550 pages, illustrated with 79 plates and various woodcuts. There has also been issued in pamphlet form the preliminary report of operations for 1878, in advance of the regular report for that year.

The Miscellaneous Publications' Series has been continued during the year by the issue of Nos. 10 and 11. Miscellaneous Publication No. 10 consists of a Bibliography of North American Invertebrate Paleontology, prepared by Dr. C. A. White and Prof. H. Alleyne Nicholson. Miscellaneous Publication No. 11 is entitled "The Birds of the Colorado Val-

ley," and consists of Part First of an extensive work upon North American Ornithology, by Dr. Elliott Coues, U. S. A. Both these treatises have become indispensable to the students of the special branches of which they respectively treat.

The Bulletins of the survey have appeared during the year with the usual regularity, the four numbers issued in 1878 forming volume IV. This publication is now established as a regular annual serial, and the present volume, like its predecessors, contains articles on a wide range of scientific topics embraced within the general scope of the operations of the survey.

The United States Entomological Commission, conducted under the auspices of this survey, has during the year issued its first annual report, as an octavo volume of nearly 800 pages, with plates and woodcuts. It is devoted to the subject of the Rocky Mountain Locust, and contains a full exhibit of the results secured by the commission appointed to investigate that important problem.

UNITED STATES GEOGRAPHICAL SURVEYS WEST OF THE ONE HUNDREDTH MERIDIAN, IN CHARGE OF FIRST LIEUT. GEORGE M. WHEELER, CORPS OF ENGINEERS, UNITED STATES ARMY.

The work during 1878 was performed by nine main parties and three astronomical parties, which operated in the States of California, Colorado, Nevada, Oregon, and Texas, and Arizona, New Mexico, and Washington Territories. Forty-six observers took the field, leaving a small force at the Washington office engaged in the preparation of maps and reports. The astronomical parties, in charge of Professor T. F. Safford, at the Ogden Observatory, Mr. J. H. Clarke in the California sections, and Mr. Miles Rock in the Colorado section, made observations at Walla-Walla, Washington Territory; the Dalles, Oregon; Fresno, California; Fort Bliss, Texas; and Fort Bayard, New Mexico, connecting with Ogden as the initial meridian.

In California, topographical parties occupied points in the Cascade Mountains and ranges to the eastward within the Great Interior Basin extending towards the Blue Ridge, reconnoitring a large area. Operations were carried southward from Lake Tahoe along the Sierra Nevada, one party occupying the White Mountain Range and connecting with the triangulation which joins the astronomical station at Austin, Nevada. A contour survey of the Washoe mining region was completed, and numerous details gathered relating to the operations of the vertical and meridional sections of the lodes.

Work for completing the topography of the section between Sierra Nevada and Cascade Ranges was also carried on. From the southern end of the Sierra Nevada a party transferred from the Utah section connected with the work of 1875 from Los Angeles east and north, and operated along the Coast Range to latitude 30° 30′ N.

In Colorado, one party, following the Rio Grande northward, filled in

details of new routes of communication and of incomplete meanders, and was further employed upon detailed work. A detachment meandered north and westward from the Rio Grande at Los Lanos, opposite Fort McRae, through the basin of the Little Colorado to Camp Apache, Arizona, and thence eastward again to the Rio Grande, making meanders of considerable precision along three natural routes of communication from the drainage basins of the Gila Salt River and Colorado Chiquito to the Rio Grande.

Another party extended the triangulation southward to connect with astronomical station at Fort Bliss, Texas; also connecting with the astronomical monument of the Mexican Boundary Survey at El Paso, Texas, and the monument on that part of the boundary-line on the western bank of the Rio Grande.

The following list shows the number of the principal observations made:

Sextant latitude stations	90
Bases measured	5
Triangles about bases measured	64
Main triangulation stations occupied	62
Secondary triangulation stations occupied	21
Miles measured on meanders	10,298
Cistern barometer stations occupied	1,141
Aneroid barometer stations occupied	7,057
Magnetic variations observed	165
Mining camps visited	12
Mineral and thermal springs noted	20

The estimated area occupied by the survey during the season, including main triangulation and preliminary reconnaissance work, was 35,000 square miles. The area from which detailed topographical data were gathered sufficient for a map, on a scale of one inch to four miles, was approximately 27,500 miles.

Besides the topographical work, one party in the Colorado section was devoted entirely to geological examination, under the charge of Professor J. J. Stevenson, assisted by Mr. J. C. Russell. Its area of operations was along the Spanish ranges between the Rio Grande and Canadian Rivers, in the northern part of New Mexico, where its labors were greatly facilitated by the use of the completed topographical maps. The section of the lignitic group was worked out, and twenty-six beds of lignitic coal were recognized as present at most localities within the area where the horizon was reached. Much labor was bestowed upon a study of the axes, the structure of which was found to be exceedingly complicated, requiring further detailed examination. Quite large collections were made of igneous rocks and fossils, about three hundred specimens of the former being obtained from seventy localities, forming a complete series illustrating the lithology of the injected dikes, volcanic overflows, and extinct craters of the region.

The fossils, numbering over thirteen hundred specimens, are from

rocks of the Carboniferous age, from Cretaceous strata, Nos. 2, 3, and 4, and from overlying beds of the Lignitic group.

From the Carboniferous formation, about seven hundred specimens were obtained; from the Cretaceous, five hundred, illustrating its invertebrate fauna; and from the coal-bearing Lignitic group, resting on the black shales of Cretaceous stratum No. 4, about two hundred specimens of fossil leaves.

Zoological collections were mainly made by the party operating from Northern California northward, and illustrate the zoology of the area extending from Camp Bidwell, California, to the Columbia River, Oregon. To this party Mr. H. W. Henshaw was attached as naturalist. The collection made comprises upwards of three hundred specimens of birds, specimens of fishes from most of the lakes and streams encountered, with *Lepidoptera*, *Orthoptera*, and numerous reptiles and Batrachians.

The field season ended early in December. The work of this survey has now covered, since its commencement in 1859, connected areas reaching from the Columbia River on the north to the Mexican border, and from the 100th meridian, near Fort Dodge, to the Pacific Coast, near Los Angeles, an area now exceeding 350,000 square miles.

The publications during the year are as follows: Vol. II, quarto series, Astronomy and Barometric Hypsometry; "A Catalogue of 2,018 Stars, for Latitude Work West of the Mississippi," and ten of the regular atlas-sheets. Vol. VI, quarto series, was in stereotype at the close of 1878; a "List of Distances, Positions, Altitudes," &c., was well advanced in printing; and Vols. I and VII, of the quarto series, awaited the appearance of Vol. VI. Seventeen atlas-sheets, also from work prior to 1878, are in various stages of progress.

GEOGRAPHICAL AND GEOLOGICAL SURVEY OF THE ROCKY MOUNTAIN REGION, BY PROF. J. W. POWELL.

The labors of this survey have been continued during 1878. From the return of the field-parties in the autumn of 1877 till July, 1878, the entire corps remained in Washington, preparing the results of the field-work for publication. In July, 1878, a division was sent to the field, but a force was also retained at Washington to continue the ethnographic work, and to complete and edit certain unfinished reports.

The office-work thus acquired an exceptional importance as compared with the field-work, which, for the season of 1878, was placed in charge of Mr. C. K. Gilbert, his principal assistants being Messrs. J. H. Renshaw, O. D. Wheeler, and S. H. Bodfish.

Taking the field at Gunnison, Utah, in the early part of August, the work was carried on by four independent parties till the middle of December, when the advance of winter made it necessary to disband them.

The Kanab base-line, four and one-third miles long, has been care-

fully remeasured, with a probable error of 1.5 inches, as well as the southern portion of the chain of triangles connecting it with the Gunnison base-line. The main change of triangulation, consisting of eight quadrilaterals, one triangle, and one pentagon, is now ready for discussion. At each end of the chain a base-line has been measured, and an astronomical determination has been made of latitude, longitude, and azimuth. The most southerly points visited were Mount San Francisco and Mount Floyd, volcanic peaks on the Colorado plateau south of Grand Cañon. Southern Utah is not well adapted for triangulation. Its principal eminences are table-lands or plateaus covered with timber, there being very few sharp peaks readily distinguishable from all directions.

The work of Mr. Renshaw's party, with plane-table and orograph, embraces all of the region lying south of the Grand Cañon in sections 105 and 106, covering about 7,500 square miles. This field comprised a portion of what is known as the Colorado Plateau, a high table-land lying immediately south of the Colorado River, which there runs westwardly at the bottom of a deep chasm. On the southern edge of the plateau there are innumerable extinct volcanoes, the ground being covered by a forest of pine, the most valuable tract of timber in Arizona. The northern edge is lower, and is bare of timber. Near the Colorado Cañon it is broken by gorges, and is difficult of access, but in other directions there is little impediment to travel. Water is scarce, and is found only in pockets and small springs, there being none available for irrigation. The only wealth of the country lies in timber and grass. West of the plateau, Mr. Renshaw's map includes a portion of Hualapai Valley and the adjacent mountains. This region is almost an absolute desert, water being so scarce that in some places it is sold by the gallon. Agriculture is out of the question, and there is no timber. Grazing is practicable to a limited extent. The only important industry, present or prospective, is mining, and only the richest of the numerous gold and silver deposits can now be worked with profit, owing to the remoteness of all sources of supplies.

Mr. Wheeler worked with plane-table and orograph in the western half of the region comprised by atlas-sheet No. 106, and estimates his total area at 5,000 square miles. Through the centre of his district there runs from north to south a natural barrier called the Echo Cliff. The escarpment faces westward, and the plateau at the west of it is 1,000 feet lower than that to the eastward. The eastern plateau is a broad desert of sand, scantily watered, and useful only for grazing purposes. The western plateau is equally barren and worthless, but presents more variety of surface. A portion consists of naked "bad lands," soft strata carved by the elements into hills of picturesque beauty, and tinted with a variety of brilliant colors which warrant the title of Painted Desert, bestowed by Lieutenant Ives. Another portion is extremely rocky, and divided by a net-work of impassable cañons. Through this region runs

the Little Colorado River, a stream of considerable magnitude, but, on account of the character of its banks, of no service to agriculture. Echo Cliff is interrupted at one point by a cross-line of drainage, and there are a few springs available for farming. No other spot invites settlement. Maps, on a scale of four miles to one inch, show the geography of the entire region embraced in the survey of Major Powell; a map is also under construction intended to represent the distribution of the various tribes of Indians when first discovered by Europeans.

Table showing the number of entries in the record-books of the United States National Museum at the close of the years 1877 *and* 1878, *respectively.*

Class.	1877.	1878.
Mammals	12,838	13,039
Birds	17,523	76,666
Reptiles and amphibians	9,500	10,015
Fishes	20,864	22,000
Skeletons and skulls	15,877	16,155
Eggs	17,500	17,791
Crustaceans	2,324	2,324
Annelids	100	100
Mollusks	30,721	31,268
Radiates	3,229	3,230
Invertebrate fossils	7,906	8,020
Minerals	20,135	20,135
Ethnological specimens	30,883	34,600
Total	245,400	255,373
Increase for 1878	.....	9,973

Approximate table of the distribution of duplicate specimens to the end of 1878.

Class.	Total to the end of 1877.		Distribution during 1878.		Total to the end of 1878.	
	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.
Skeletons and skulls.	536	1,818	4	60	540	1,878
Mammals	2,159	4,810	8	12	2,167	4,822
Birds	27,594	41,866	123	148	27,717	42,014
Reptiles	2,135	3,488	221	352	2,356	3,840
Fishes	6,140	9,645	5	6	6,145	9,651
Nests and eggs of birds	7,639	18,746	267	604	7,906	19,350
Insects	4,209	9,500	99	241	4,308	9,741
Crustaceans	1,089	2,664	0	0	1,087	2,664
Shells	90,171	196,443	377	904	90,548	197,347
Radiates	593	793	0	0	593	793
Other marine invertebrates	1,892	5,225	0	0	1,892	5,225
Plants and packages of seeds	29,437	50,969	506	1,015	29,943	51,984
Fossils	4,361	10,468	30	50	4,391	10,518
Minerals and rocks	9,104	16,868	1	1	9,105	16,869
Ethnological specimens	2,234	2,681	1,389	2,587	3,623	5,268
Diatomaceous earths (packages)	428	1,182	446	446	874	1,628
Total	189,719	377,166	3,476	6,426	193,195	383,592

ADDITIONS TO THE COLLECTIONS OF THE NATIONAL MUSEUM IN 1878.

Akron (Ohio) City Museum. Eighteen species of fresh-water *Unios;* from Ohio.

Albro, Samuel (through Hon. Samuel Powel). Fish (*Pseudopriacanthus altus*); from Newport, R. I.

Aldrich, Charles. Collections of living snakes, turtles, and frogs; and specimens of Indian relics; from Iowa.

Alexander, James H. Box of ethnological and mineralogical specimens; from New York.

Allen, Charles A. Collection of birds' eggs and nests, and six living turtles; from California.

Allen, Charles S. Collection of birds' skins and eggs; from Long Island, N. Y.

Allen, George K. (See Washington, D. C., United States Fish Commission.)

Anderson, Capt. Chris. (See Washington, D. C., United States Fish Commission.)

Anderson, E. J. Salmon (*Salmo salar*); from the Delaware River.

Anderson, William. Six stone implements; from Illinois.

Andrews, Frank D. Eight rude arrow-heads; from New Jersey.

Andrews, F. S. (See Washington, D. C., United States Fish Commission.)

Artes, Charles F. Photographs and drawings of Indian relics, and relics from mounds in Illinois.

Armistead, E. P. Ball of hair taken from stomach of cow.

Atkins, Charles G. Three boxes of fishes; from Bucksport and Grand Lake Stream, Maine.

Atkinson, John. (See Washington, D. C., United States Fish Commission.)

Babcock, A. L. Six birds' skins; from Massachusetts.

Babson, Fitz J. (See Washington, D. C., United States Fish Commission.)

Babson, Fitz J., jr. (See Washington, D. C., United States Fish Commission.)

Babson, William H. (See Washington, D. C., United States Fish Commission.)

Baird, Prof. S. F. Five gudgeons (*Hybognathus regius*), from Babcock Lake; three terrapins, from the Susquehanna River.

Baker, Captain. (See Washington, D. C., United States Fish Commission.)

Banta, W. V. and J. Garrison. Bones of human skeleton; taken from Indian mound at Salem, Iowa.

Barber, E. A. Articles of Indian ornament, from Arizona and Utah; marine animals and Indian stone relics, from New Jersey, Pennsylvania, and Maryland.

Barker, Dr. S. W. Mud-eel (*Siren lacertina*); from Charleston, S. C.
Barth, Henry. Mineral; from Maryland.
Bartlett, A. (See Washington, D. C., United States Fish Commission.)
Bassett, L. Stone axe; from Iowa.
Bates, James. (See Washington, D. C., United States Fish Commission.)
Bausett, William A. (See Washington, D. C., United States Fish Commission.)
Bean, Dr. T. H. Collection of stone implements, from Eastern Pennsylvania; collection of frogs, snakes, lizards, and fishes, from Prince George's County, Maryland; four specimens of fish, from Norfolk, Va.
Beardsley, Grant. Stag-beetle (*Cerphus elephas*); from North Carolina.
Beauchamp, Rev. W. M. Five stone implements; from New York.
Beckwith, Harney. (See King's Mountain Mine.)
Belding, L. Seven boxes of birds' skins and twelve Indian relics; from California.
Bell, William. Specimen of iron pyrites; from Virginia.
Bellamy, Frank H. Box of fragmentary erennite stems, from Alabama; Indian relics, from Alabama and North Carolina.
Bendire, Capt. Charles, U. S. A. Nest and eggs of *Passerella townsendii* var. *schistacea*, and Clark's crow, also box of birds' skins; from Oregon.
Benner, D. B. Squeezed copy of rock inscription and Indian relics; from Virginia.
Berlin, A. F. Collections of stone implements; from Reading, Pa.
Bernays, Lewis A. Photographs of mummies found in forks of trees, Queensland, Australia.
Berry, Henry. Steel dagger used by Wisconsin Indians.
Biddle, Henry J. Box of relics exhumed from mound in Florida.
Bigelow, O. Stone implement; from New York.
Blackburn, Capt. William. (See Washington, D. C., United States Fish Commission.)
Blackford, E. G. Many specimens of fish (salmon, cod, trout, shad, &c.), brought to Fulton Market, New York, from various parts of the United States.
Blackly, C. P. Mounted specimen of American eared grebe (*Podiceps auritus* var. *californicus*); from Kansas.
Blake, Capt. J. G., U. S. R. M. Specimen of *Remora;* from Rhode Island.
Bland, Thomas. Specimens of shells (*Bulimus, Pagurus*, and *Lignus*); from Tobago and Gonaive Islands.
Blatchford, Capt. B. F. (See Washington, D. C., United States Fish Commission.)
Boardman, George A. Specimens of spotted ury-mouth (*Cryptacanthodes maculatus*) and stickleback (*Gasterosteus biaculeatus*); from Calais, Maine.
Boehmer, George H. Collection of "fossil-casts," from Maryland; specimen of itacolumite, from North Carolina.
Bomar, Thomas H. Snakes (*Ophibolus getulus, Crotalus miliaris*) and arrow-heads; from South Carolina.

Boston, Mrs. C. B. Box of shells; from Illinois.

Brace, Lewis J. K. Box of birds from the Bahama Islands. (Received in 1877.)

Brackett, Col. A. G., U. S. A. Head of eel-pout, from Little Big Horn River, Montana; specimen of field-mouse (*Arvicola*), from Montana.

Brady, Samuel. . Copper spear and barrel of stone mining-hammers; from Michigan.

Braner, William. Collection of copper and flint arrow-heads; from Wisconsin.

Brazier, Benjamin S. (See Washington, D. C., United States Fish Commission.)

Breed, E. E. Nest of "carpenter-bee."

Braîon, Fred. Specimens of arrow-heads, &c.; from West Virginia and Indiana.

Brewer, Dr. T. M. Egg of Clarke's crow.

Brewster, William. Five skins of *Sitta pusilla.*

Briggs, Captain. (See Washington, D. C., United States Fish Commission.)

Brisbane. (See *Queensland.*)

Britt, Thomas A. Collection of Florida shells.

Brock, R. A. Cocoons of *Cecropia* silk-work; from Virginia.

Brodnax, Benjamin H., M. D. A fine collection of stone axes, spear and arrow heads, hematite plummets, &c.; from Louisiana.

Brown, Dr. J. J. Specimen of coral (*Diploaria cerebriformis*); from Nassau, N. P.

Brown, Stephen S. Sample of "Nicaragua" wheat; from Waco, Texas.

Brown, William. (See Washington, D. C., United States Fish Commission.)

Bryan, Oliver N. Box of rude stone implements; from Maryland.

Burbank, Martin. (See Washington, D. C., United States Fish Commission.)

Burger, Peter. Carolina rail (*Porzana carolinensis*); from Virginia.

Burke, Henry E. (See Washington, D. C., United States Fish Commission.)

Burnes, B. J. Specimen of *samarskite;* from Alabama.

Burns, Thomas. (See Washington, D. C., United States Fish Commission.)

Bullock, Theron. Copper nodule; from Wisconsin.

Butler, Isaac. (See Washington, D. C., United States Fish Commission.)

Cadle, C. Indian pipe of micaceous sandstone; from the east shore of Mobile Bay, Alabama.

Calderwood, Capt. M. W. (See Washington, D. C., United States Fish Commission.)

Cambridge, Mass., Botanic Garden of Harvard University, C. S. Sargent, Director. Seeds and plants of aquatic plants (*Nymphæa tuberosa, Rumex hydrolapatum*, &c.).

Cambridge, Mass., Museum of Comparative Zoology. Box of birds' skins, box of alcoholic specimens of general natural history, and specimen of menhaden (*Brevoortia aurea*).

Campbell, J. B. Specimens of reptiles, turtles, and batrachians; from Iowa.

Campbell, Kent. Nest and eggs of wood pewee (*Contopus virens*); from Ohio.

Capehart, Dr. W. R. Specimens of shad and herring; from Avoca, N. C.

Capron, John. (See Washington, D. C., United States Fish Commission.)

Capron, General Horace. Two dressed figures representing the noble class of Japan. (Purchased.)

Chappell & Storer (through E. G. Blackford). Large number of *Trachurops crumenophthalmus.*

Carlsen, Arnold. (See Washington, D. C., United States Fish Commission.)

Carritt, William. (See Washington, D. C., United States Fish Commission.)

Carroll, Capt. Daniel. (See Washington, D. C., United States Fish Commission.)

Case, Thomas S. Specimen of *Lota maculosa;* from Missouri.

Cavener, Nicholas. (See Washington, D. C., United States Fish Commission.)

Chester, H. C. Jar of fishes, from the Potomac River; model of cod-fish hatching apparatus.

Chicago Academy of Science. Collection of shells; from Florida.

Childs, Edward R. (See Washington, D. C., United States Fish Commission.)

Churchill, R. C. Malformed robin (*Turdus migratorius*); from New York.

Clark, Benjamin. (See Washington, D. C., United States Fish Commission.)

Clark, Frank N. Water-snake; from Spesutia Island, Maryland.

Clark, Samuel C. "Mule-killer" (*Thelyphonus gigantens*), from Florida; arrow-heads and fragmentary pottery, from Georgia.

Clarke, Prof. F. L. Box of ethnological and natural-history specimens; from Hawaii.

Clarke, J. H. Box of fossils (fishes, &c.); from Connecticut.

Clarke, Dr. W. M. Mica arrow-head and shell; from mound in Tennessee.

Clinton, Capt. George T. (See Washington, D. C., United States Fish Commission.)

Coast Wrecking Company, New York (through W. R. T. Jones). Specimen of marble bored by sponge (*Cliona*); taken from the wreck of the steamer Grecian off Long Island.

Colby, Charles. (See Washington, D. C., United States Fish Commission.)

Cole, J. R. Iron pyrites; from Texas.

Collins, Capt. Joseph W. (See Washington, D. C., United States Fish Commission.)

Collins, William. (See Washington, D. C., United States Fish Commission.)

Compton, J. W. Larvæ of *Helophilas anax*; from North Carolina.

Conley, John. (See Washington, D. C., United States Fish Commission.)

Conrad, L. Specimen of mineral; from Ohio.

Cook, Caleb. Two bottles of fish-oil.

Cook, D. S. Stone sinker and axe; from Pennsylvania.

Cooper, William A. Skin of *Ptychorhamphus aleuticus;* from Santa Cruz, Cal.

Cope, Prof. E. D. Two living lizards (*Crotaphytus collaris*); from Texas.

Coster, John. Small stone axe; from Wisconsin.

Crawford, General S. W. Box of geological specimens and birds; from Iceland.

Cressy, Charles C. (See Washington, D. C., United States Fish Commission.)

Crittenden, A. R. Three boxes of Indian relics; from the New England States.

Crooke, John J., New York, N. Y. Twenty-five pounds of pure tin.

Cunningham & Thompson. (See Washington, D. C., United States Fish Commission.)

Curle, Dr. T. J. Hair-worm (*Gordius*); from Kentucky.

Curtis, Captain. (See Washington, D. C., United States Fish Commission.)

Cushing, Frank H. Collections of rude potstone vessels, from Virginia and District of Columbia; living reptiles, from Virginia.

Cuvier Club, Cincinnati, Ohio. Collection of bird-skins, from Indiana, Ohio, and Florida.

Dall, W. H. Four specimens illustrative of the economic application of shells; two marine shells from Japan; two land shells from Germany.

Dalrymple, Dr. Specimens of Indian pottery; from Maryland.

Danforth, John. (See Washington, D. C., United States Fish Commission.)

Davis, Mrs. Abby L. (See Washington, D. C., United States Fish Commission.)

Davis, Capt. Alfred B., U. S. R. M. Specimen of coral; from the Dry Tortugas, Florida.

Davis, Henry. Samples of soil and wood; from McGregor, Indiana.

Davis, Joshua. Indian chunky-stone; from District of Columbia.

Davis, L. Specimen of iron ore; from Missouri.

Davis, M. C. Specimen of iron ore; from Harper's Ferry.

Davis, Mrs. Mary E. (See Washington, D. C., United States Fish Commission.)

Day, Thomas, Keeper of Seguin Light, Maine. Three fish-hooks.

De Hart, J. N. Box of Indian bones and relics; from mound in Illinois.

Dempsey, Capt. William. (See Washington, D. C., United States Fish Commission.)

Dennis, George R. Box of sea-weed and *Trichiurus lepturus;* from Maryland.

Denton, Shelley W. Eggs of burrowing owl; from Fort Collins, Colorado.

Devan, James. (See Washington, D. C., United States Fish Commission.)

Devoe, Capt. Luke. (See Washington, D. C., United States Fish Commission.)

Dexter, Newton. Eggs of *Phæton flavicauda;* from Bermuda.

Dixon, Eugene F. (See Washington, D. C., United States Fish Commission.)

Dixon, Capt. Geo. W. (See Washington, D. C., United States Fish Commission.)

Doran, Thomas S. Specimens of turtles and fish; from Montgomery, Ala.

Douglas, W. T. Insect; from Catlett's, Va.

Douglass, John. (See Washington, D. C., United States Fish Commission.)

Douglass, Robert, 2d. (See Washington, D. C., United States Fish Commission.)

Driggs, John W. Collection of birds' skins; from Florida.

Driscoll, Daniel. (See Washington, D. C., United States Fish Commission.)

Duffield, U. S. G. Malformed eggs of common hen.

Dugès, Dr. Don Alfredo. Box of natural history specimens; from Guanajuato, Mexico.

Dulaney, John. (See Washington, D. C., United States Fish Commission.)

Duncan, Capt. J. F. (See Washington, D. C., United States Fish Commission.)

Earle, T. L. Small box of minerals; from North Carolina.

Edwards, Vinal N. Eleven boxes of fishes collected in Vineyard Sound, Massachusetts.

Eggert, H. Four living turtles; from Missouri.

Ellis, Albert N. Specimens of snakes; from Florida.

Ellis, J. B. Collection of North American fungi.

Espersen, Henry, Surveyor-General of Dakota. Two packages of minerals; from Dakota.

Etzel, C. Stone axe; from Wisconsin.

Evans, Samuel B. Four stone implements, from Iowa; casts of stone axe and pipe from Kansas.

Evans, W. W. A large collection of pottery, silver and copper idols, bronze implement, and egg of emu; from Peru. Also, 27 sheets of photographs of Peruvian antiquities.

Ferguson, Mr. (through O. C. Treadway). Specimens of minerals; from Big Sioux River, Iowa.

Finsch, Dr. Otto. Twelve species of Siberian fishes.

Firth, William A. Three samples of diatomaceous earths; from Ireland.

Flanagan, A. H. Collection of stone implements and pottery, and human and animal bones; from a mound in Virginia.

Flint, Dr. Earl. Two boxes of fossils and alcoholic specimens; two boxes ethnological specimens; from Nicaragua.

Floyd, Joseph D. (See Washington, D. C., United States Fish Commission.)

Fox, F. N. (through Rev. J. J. McCook). Rough stone axe-head, fragment of celt, and fragment of pottery; from Niantic, Conn.

Foster, Mrs. Abner. Box of stone implements; from Illinois.

France, Museum of Natural History. Collection of fishes from the Mediterranean Sea and rivers of France.

Frazer, Charles. Pottery figure; from Botica, Puerto Plata.

French, S. Levin. Four boxes of "American sardines."

Friend, Sidney. (See Washington, D. C., United States Fish Commission.)

Gaffney, William M. (See Washington, D. C., United States Fish Commission.)

Gaines, A. S., and K. M. Cunningham. Terra-cotta mask; from vicinity of Mobile, Ala.

Galbraith, F. G. Four boxes of stone implements, collection of alcoholic fishes, insects, &c., and a small living alligator; from Eastern Pennsylvania.

Garret, W. M. Pottery fragments, spear-head, and quartz crystal; from Alabama.

Gates, D. C. (through Rev. J. J. McCook). Stone chisel; from Niantic, Conn.

Gatschet, A. S. Samples of the food of the Klamath Indians of Oregon.

Gere, J. E. Collection of copper knives, spear and arrow heads, masses of native copper and flint arrow-heads, stone axes, &c.; from Wisconsin.

Germany, Berlin Museum, Dr. E. von Martin. Nine species of shells.

Gerrard, Edward, Jr. Sixteen mounted specimens of English quail, woodcock, and snipe. (Purchased.)

Gessner, William. Collection of Indian arrow-heads, &c.; from Alabama.

Getchell, Capt. John Q. (See Washington, D. C., United States Fish Commission.)

Gibbs, George J. Collection of ethnologica; from Grand Turk, West Indies.

Gibbs, J. D. Three malformed feet of pig.

Gilbert, Rev. C. A. Collection of shells, insects, fossils, &c.; from Florida.

Ginnevan, Thomas, and Philip Merchant. (See Washington, D. C., United States Commission.)

Githens, W. H. Box of shells and casts of Indian relics; from Illinois.

Godding, Dr. W. W. Specimen in flesh of bear (*Ursus americanus*).

Goff, George P. "Sea-dollar"; from Galveston, Tex.

Goode, F. C. Collection of living snakes; from Florida.

Goode, G. Brown. Tank of alcoholic fishes and three boxes living snakes and turtles, from Florida; box of fishes, corals, &c., from Charleston, S. C.; three cans alcoholic fishes, from Bermuda. Also, fresh specimens of shad, from the St. John's River, Florida.

Goodrich, Wilbur F. Specimens of fungi; from Massachusetts.

Goodwin, Thomas. (See Washington, D. C., United States Fish Commission.)

Gore, H. Specimen of ore; from Pennsylvania.

Gorton, Slade & Co. (See Washington, D. C., United States Fish Commission.)

Goslin, Capt. Joseph. (See Washington, D. C., United States Fish Commission.)

Goss, N. S. Skin of *Parus atricapillus;* from Wisconsin.

Gourville, Capt. John. (See Washington, D. C., United States Fish Commission.)

Green, F. C. Box of stone implements and collection of minerals; from Wisconsin.

Green, Dr. Samuel A. Cast of Indian pot found at Canterbury, N. H.

Greenleaf, Capt. William H. (See Washington, D. C., United States Fish Commission.)

Griffith, William. Two roe-shad; from the Ohio River.

Grüber, Ferdinand. Two living turtles (*Chelopus marmoratus*); from California.

Gunnan, Miss Bessie C. Scale of tarpum (*Megalops thrissoides*); from near Norfolk, Va.

Hallock, Charles. Specimen of *Coregonus quadrilateralis;* from Michigan.

Hamlen, Capt. Peter. (See Washington, D. C., United States Fish Commission.)

Hardenburgh, A. R., United States Surveyor-General, California. Collection of the ores of various mines in California.

Harker, O. H. Collection of minerals; from Colorado.

Harris, R. S. Specimen of *itacolumite;* from North Carolina.

Hartsfield, John M. Skink snake, from North Carolina; and eggs of white-eyed flycatcher, from Delaware.

Harvey, Edward. (See Washington, D. C., United States Fish Commission.)

Harvey, Rev. M. Alcoholic specimens of capelin; from Newfoundland.

Haskell, Samuel. (See Washington, D. C., United States Fish Commission.)

Haskin, S. D. Flint arrow-head; from Tennessee.

Hawkins, Capt. James. (See Washington, D. C., United States Fish Commission.)

Hawkins, Capt. Z. (See Washington, D. C., United States Fish Commission.)

Harneus, ———, Stockholm, Sweden. Series of manufactured fire-bricks.

Hayward, F. W. Box of rice plants, tank of alcoholic fishes, reptiles, &c., living specimens of mud-puppy (*Siren lacertina*), and living snapping-turtles; from South Carolina.

Haywood, W. P. Two red ants; from New Jersey.

Helper, H. R. (*through George Hillier*). Saw of sawfish (*Pristis antiquorum*).

Hemphill, Henry. Collection of land and fresh-water shells, from Utah; collection of shells and fossils, from California.

Hempstead, Elias. Box of ethnological specimens; from Santa Rosa Island, Florida.

Henderson, Judge J. G. Box of ethnological specimens; from Illinois.

Henderson, Mr. (*through Dr. H. B. Noble*). Slate carving; from the Northwest coast of America.

Hendricks, Lindsley. Mineral; from Texas.

Henshaw, H. W. Living turtle (*Cistudo clausa clausa*) and nest and eggs of *Seiurus aurocapillus* and *Turdus mustelinus;* from Washington, D. C.

Hering, Dr. C. J. Collection of alcoholic mammals, reptiles, insects, &c.; from Surinam.

Herring, Richard. (See Washington, D. C., United States Fish Commission.)

Hessel, Rudolph. Two specimens of snake (*Tropidonotus sipedon*); from Baltimore, Md.; and one of *Hyla arborea*, from Germany.

Hewitt, Isaac L. (See Washington, D. C., United States Fish Commission.)

Higbie, A. B., & Co. Specimen of *Tetrodon lævigatus;* from off Cape Henlopen.

Higgins & Gifford. (See Washington, D. C., United States Fish Commission.)

Hillier, Fred. (See Washington, D. C., United States Fish Commission.)

Hirst, F. Specimens of amblystoma and larvæ and fishes (*Potamocottus*), from Utah; and fishes (*Potamocottus, Catostomus*), from Wyoming.

Hitchcock, Prof. E. Casts of Indian vessels.

Hitchcock, George N. Specimens of living turtles; from California.

Hitt, Dr. D. F. Box of fossil plants; from Illinois.

Hodgdon, Capt. T. F. (See Washington, D. C., United States Fish Commission.)

Hodgkins, Edward W. (See Washington, D. C., United States Fish Commission.)

Holbrook, W. C. Flint arrow-head, stalagmite, fossil shell and bone of human foot; from Illinois.

Hollenbush, H. W. Box of minerals; from Pennsylvania.

Homans, Capt. Charles A. (See Washington, D. C., United States Fish Commission.)

Horan, Henry. Turtle (*Chelopus guttatus*); from Washington D. C.

Horod, C. H. Two fossil teeth of horse.

Hough, Dr. F. B. Cast of tusk of fossil elephant, found near Copenhagen, N. Y.

Hoy, Geo. W. (See Washington, D. C., United States Fish Commission.)

Hoy, R. R. Snake (*Coluber*) and turtles (*Chrysemys*); from Michigan.

Hubregtse, A. Three arrow-heads.

Hudson, J. M. Pharyngeal teeth of sheeps-head.

Hughes, W. N. Specimen of fossil coral; from Tennessee.

Hunt, Henry C. Four articles of native dress; from Peru and Bolivia.

Hunt, Capt. H. W. Samples of cordage and duck manufactured by the Russian Government.

Hurlbert, Capt. R. H. (See Washington, D. C., United States Fish Commission.)

Huss, Oscar E. Specimens of woods, teas, and ethnologica; from Uruguay, Paraguay, Chile, and Argentine Republic.

Hutchinson, Dr. Edwin. Four small terra-cotta masks; from near San Juan de Teotihuacan, Mexico.

Illinois State Laboratory. Living turtle.

India, Kurrachee Municipal Library and Museum, James A. Murray, Curator. Collection of skins, heads and skulls of East Indian mammals.

Ingersoll, T. Dwight. Specimens of shells; from Lake Erie.

Irion, Dr. I. L. Spear-head and skull of alligator; from Texas.

Irwin, Alexander H. Sample of polished fossiliferous stone.

Jackson, Dr. E. E. Specimens of turtles, salamanders, and fishes; from South Carolina.

James, Dr. Frank L. Collection of pottery and stone implements; from Arkansas.

Jameson, John S. (See Washington, D. C., United States Fish Commission.)

Jefferson, Lieut. J. P., U. S. A. Specimen of *Aulostoma colorata;* from the Dry Tortugas, Florida.

Jellow, John H. (See Washington, D. C., United States Fish Commission.)

Jenison, O. A. Collection of stone axes, knives, fleshers, &c.; from Michigan.

Jenks, J. W. P. Lot of stone hammers found in old steatite quarry near Providence, R. I.

Jenner, David. Copper spear-head; from Wisconsin.

Jewett, Thomas. (See Washington, D. C., United States Fish Commission.)

Johnson, Capt. George A. (See Washington, D. C., United States Fish Commission.)

Johnson, Capt. Peter. (See Washington, D. C., United States Fish Commission.)

Johnson, Mr. (through J. E. Gere). Copper nodule; from Wisconsin.

Kaucher, William. Samples of fire-clay; from Wisconsin.

Kearney, William. (See Washington, D. C., United States Fish Commission.)

Keep, Josiah. Package of diatomaceous earth, from Massachusetts; alcoholic specimens of *Cerithidea sacrata*, from Lake Merritt, California.

Keithley, Mrs. E. (through Rev. F. B. Scheetz). Large stone celt; from Missouri.

Keller, John. Stone axe; from Missouri.

Kervey, H. F. Specimens of skins, nests, and eggs of birds, mammals, minerals, and Indian relics; from Maryland and Pennsylvania.

Kilpatrick, Capt. Briggs. (See Washington, D. C., United States Fish Commission.)

King, James. Three malformed eggs of domestic hen.

King, Larkin. Mineral; from Texas.

King, W. A. (See Washington, D. C., United States Fish Commission.)

King's Mountain Mine, North Carolina, Harney Beckwith, President. Machinery used in extracting gold at, and a series of the ores of, the King's Mountain Mine.

Kippen, John. (See Washington, D. C., United States Fish Commission.)

Klotz, H. E. Living iguana; from Navassa, W. I.

Knowles, Mr. Dried sound of hake.

Kocher, J. F. Three fœtal flying squirrels (*Pteromys volucella*); from Pennsylvania.

Kollmann, Dr. Collection of crania of the natives of Hungary, Austria, and Bavaria.

Kumlien, Ludwig. Skin, nest, and eggs of *Zonotrichia coronata;* from Shasta, California. Also 24 boxes of general natural history and ethnological collections; from Cumberland Island and Greenland.

Lake, C. W. Block of black-ash; from Michigan.

Lakeman, J. (See Washington, D. C., United States Fish Commission.)

Lamson, J. S., & Brother. Arrow-head and earth; from ancient grave in Chiriqui, Central America.

Langdon, Frank W. Collection of birds' skins and ethnological specimens; from Ohio.

Larkin, John. (See Washington, D. C., United States Fish Commission.)

Lauermann, Peter. Collection of flint arrow-heads, copper knife, two darts, and nodule; from Wisconsin.

Lawrence, J. J. Insect; from Beresford, Florida.

Lawson, James. Specimen of asbestos; from Alabama.

L'Acee, M. S. Specimen of calc-spar; from Texas.

Le Blanc, Simon. (See Washington, D. C., United States Fish Commission.)

Leonard, William. Specimen of ore; from Pennsylvania.

Leslie, C. C. Many fresh specimens of fish from Charleston, S. C., markets.

Lettermann, George W. Shell of periwinkle.

Lewis, James. Two boxes of living snails (*Vivipara contectoides*); from Mohawk, N. Y.

Lewis, W. H. Cast of canoe-shaped object, from Seneca Lake, New York; and box of minerals, from Westchester County, New York.

Lieber, H. Quartz pebble with adherent mica.

Lloyd, J. D. (See Washington, D. C., United States Fish Commission.)

Locke, W. M. Two boxes of stone implements; from Ohio and Western New York.

Lovett, Dr. A. A. Specimen of petrified coral; from Indiana.

Low, Maj. D. W., Postmaster, Gloucester, Mass. Collection of fossiliferour rocks; from George's Banks.

Lowe, Francis A. Specimens of copper and silver ores and amethyst; from the north shore of Lake Superior.

Lundberg, John A. (See Washington, D. C., United States Fish Commission.)

Lytte, A. E. Thirty-two specimens of cisco (*Argyrosomus*); from Geneva Lake, Wisconsin.

McBride, Sara J. Twelve samples of artificial trout-flies.

McClelland, Dr. M. A. Collection of stone implements; from Illinois.

McCollum, George. (See Washington, D. C., United States Fish Commission.)

McCook, Rev. J. J. Two human crania and box of Indian relics; from Niantic, Conn.

McCormick, E. G. Stone image (head); from Missouri.

McCown, General J. P. Box of ethnological and natural history specimens; from Arkansas.

McDonald, Duncan. (See Washington, D. C., United States Fish Commission.)

McDonald, James and John D. (See Washington, D. C., United States Fish Commission.)

McDonald, Capt. Jerome. (See Washington, D. C., United States Fish Commission.)

McDonald, Marshall. Specimen of Dufrènite; from Virginia.

McDonald, Capt. Matthew. (See Washington, D. C., United States Fish Commission.)

McDonald, Miles. (See Washington, D. C., United States Fish Commission.)

McDonald, Capt. William. (See Washington, D. C., United States Fish Commission.)

McEachern, Daniel. (See Washington, D. C., United States Fish Commission.)

McElderry, Dr. Henry, U. S. A. Package of marine diatoms; from Fort Monroe, Va.

McEntire, Daniel. (See Washington, D. C., United States Fish Commission.)

McGinnis, Captain. (See Washington, D. C., United States Fish Commission.)

McGuire, J. C. Lot of fragmentary steatite vessels; from Grimes Place, Md.

McGuire, J. D. Three polished-stone arrow-heads; from Howard County, Maryland.

McInnis, L. L. Chrysalis of moth; from Texas.

McKinley, William. Stone tube; from Georgia.

McKinnon, Capt. D. (See Washington, D. C., United States Fish Commission.)

McKinnon, Capt. John. (See Washington, D. C., United States Fish Commission.)

McNeill, J. A. (through J. S. Lamson & Co.). Nest and eggs of tinamoo; from Chiriqui, U. S. of Colombia.

McPhee, Capt. N. (See Washington, D. C., United States Fish Commission.)

McQuinn, Michael. (See Washington, D. C., United States Fish Commission.)

McQuinn, Edward. (See Washington, D. C., United States Fish Commission.)

Madden, Henry F. (See Washington, D. C., United States Fish Commission.)

Maggs, P. F. Moth; from Indiana.

Mansfield, James, & Sons. (See Washington, D. C., United States Fish Commission.)

Martin, Capt. George H. (See Washington, D. C., United States Fish Commission.)

Martin, S. J. (See Washington, D. C., United States Fish Commission.)

Marshall, Henry. Living snake (*Heterodon*); from Maryland.

Mason, Prof. O. T. Nest of meadow-lark (*Sturnella magna*).

Mason, Peter. (See Washington, D. C., United States Fish Commission.)

Mason, Hon. Roswell H., U. S. Surveyor-General, Montana. A large collection of minerals from various mines in Montana.

Masterson, Thomas. Glass and shell beads and fragments of Indian pipes; from Western Pennsylvania.

Mather, Fred. Two crustaceans.

Matteson, F. S. Bat (*Vespertilio pruinosus*); from Oregon.

Matthews, Dr. Edward, U. S. N. Jar of fishes, reptiles, and invertebrates; from Santo Domingo.

Mauler, Eugene. Samples of diatomaceous earths; from Italy, Jutland, and Bohemia.

Maw, Richard (through Anderson Merchant & Co., New York). Collection of tiles, pottery, and majolica, exhibited at the Permanent Exhibition, Philadelphia, Pa.

Meek, James. (See Washington, D. C., United States Fish Commission.)

Meigs, General M. C., U. S. A. Indian pipe of catlinite.

Menezer, Joseph. (See Washington, D. C., United States Fish Commission.)

Mercer, R. W. Collection of stone axes, arrow-heads, &c.; from Ohio.

Merchant, George J. (See Washington, D. C., United States Fish Commission.)

Merchant, Philip. (See Washington, D. C., United States Fish Commission.)

Merrill, Dr. J. C., U. S. A. Box of mammal and bird skins; from Texas.

Mexico, National Museum of, G. Mendoza, Director. A valuable collection of ancient Mexican pottery and stone relics.

Middleton, Carman & Co., New York. Two shad (*Alosa sapidissima*).

Middletown, Conn., Museum of Wesleyan College. A collection of fishes from Bermuda and one of reptiles from the New England States.

Miller, J. D. Rattlesnake (*Crotalus*); from New York.

Miller, Thomas I. Specimen of iron ore; from West Virginia.

Milner, J. W. Shells (*Viripara georgiana*), from Lake Monroe, Florida; salmon (*Salmo salar*), from Chesapeake Bay, Maryland; box of living salamanders (*Plethodon glutinosus*), from Albemarle Sound, North Carolina.

Mitchell, B. Specimens of ethnologica; from Illinois.

Mitchell, G. M. Specimen of "Quillback" (*Carpiodes* sp.); from Illinois.

Mitchell, Mr. (through Hon. George Williamson, United States Minister to Central America). Fœtal shovel-nosed shark from Acajutla, Salvador.

Möbius, Prof. Karl. Collection of mollusca; from Germany.

Mohr, C. Box of ethnological specimens; from Alabama.

Moody, H. A. Specimen of kaolin; from Mississippi.

Moore, Mr. H. C. (See Washington, D. C., United States Fish Commission.)

Moore. (See Porter, Dr. J. Y., U. S. A.)

Morris, A. P., Jr. Skull of possum (*Didelphys virginianus.*)

Morris, Edward S., & Co. Package of seeds of Liberian coffee plant.
Morrisey, Capt. Daniel C. (See Washington, D. C., United States Fish Commission.)
Morrisey, James D. (See Washington, D. C., United States Fish Commission.)
Morrison, Capt. R. N. (See Washington, D. C., United States Fish Commission.)
Morse, Prof. E. S. Collection of ethnologica, fishes and two rodents; from Japan.
Morsfelder, George. Copper spear-head; from Wisconsin.
Mortimer, Capt. J. H. Collection of dried marine animals; from the equatorial Pacific.
Motala Iron and Steel Manufacturing Company, Sweden. Collection of manufactured steel and iron, being their exhibit at the International Exhibition, 1876, at Philadelphia, Pa.
Munroe, Prof. Charles, E., U. S. N. Box of eocene tertiary fossils; from South River, Md.
Murphy, J. (See Washington, D. C., United States Fish Commission.)
Murphy, Michael J. (See Washington, D. C., United States Fish Commission.)
Murphy, Capt. Nicholas. (See Washington, D. C., United States Fish Commission.)
Murray, David. Living turtle; from Ellaville, Fla.
Mynster, William A. Two salmon; from Iowa.
Nelson, E. W., Signal Service, U. S. A. Nineteen boxes of general natural history and ethnological specimens; from Saint Michaels, Alaska.
Nevins, Rev. R. D. Upper jaw of *Hypsifario Kennerlyi*; from Oregon.
New Jersey, College of Princeton, N. J. Plaster casts of stone implements.
New Zealand, Auckland Museum, T. F. Cheeseman, Curator. Twenty-one crania of the Maori.
Newberry, Dr. J. S. Specimens of silicified wood; from California and Antigua, W. I.
Newlon, W. S. Specimens of *Productus punctatus*; from Kansas.
Newman, William P. Bone of turtle; from mound in Alabama.
Nesbit, John. Specimen of phosphatic rock; from Georgia.
Noble, Dr. H. B. Carved duck-shaped stone; from Northwest coast.
Nolan, Joseph. (See Washington, D. C., United States Fish Commission.)
Norris, J. E. Specimen of ore from the Gila mine, Nevada.
Norris, P. W., Superintendent of Yellowstone National Park. Collection of minerals, pottery, and stone implements.
Norton, Dr. (through Rev. F. B. Scheetz). Specimens of aboriginal stone implements; from Missouri.
Norway, W. H. Specimens of invertebrate fossils; from California.

Nott, W. R. (*through Rev. F. B. Scheetz*). Perforated tablet; from Missouri.

Nye, Willard, jr. Specimens of *Gasterosteus biaculeatus;* from New Bedford, Mass.

Ober, F. A. Seven boxes of general natural history and ethnological specimens; from various islands of the West Indies.

Olmsted, E. B. Box of stone implements; from Illinois.

Olsen, Captain. (See Washington, D. C., United States Fish Commission.)

Orme, William & Sons. Large living spider.

Osborne, L. C. Two oval hornstone disks; from Illinois.

Osgood, F. Storey. Two specimens of mineral; from Massachusetts.

Otis, Dr. George A. Two living iguanas; from Navassa, West Indies.

Palmer, Joseph. Mounted head of Virginia deer and specimen of snake (*Ophibolus doliatus*); from Virginia.

Palmer, William. Living snake (*Tropidonotus sipedon*); from Virginia.

Parsons, John. (See Washington, D. C., United States Fish Commission.)

Parsons, William. (See Washington, D. C., United States Fish Commission.)

Peacock, J. S. Jaw of shark (*Eulæmia Milberti.*)

Pearce, F. A. (See Washington, D. C., United States Fish Commission.)

Pease, A. P. L. Stone mortar; from Ohio.

Pease, W. B. Insect; from New Mexico.

Peel, J. R. Specimen of mineral; from Texas.

Pendleton, A. G., Deputy Surveyor, Arizona. Specimens of gold, silver, and copper ores; from Arizona.

Pensacola Ice Company, Florida. Many fresh specimens of fish taken in the vicinity of Pensacola, Fla.

Pergande, Theodore. Stone axe; from Missouri.

Peterson, Martin, and Dennis Theleueng. (See Washington, D. C., United States Fish Commission.)

Peterson, M. R. (See Washington, D. C., United States Fish Commission.)

Pettibone, William. Taylor-shad (*Dorysoma cepedianum*); from the Potomac River.

Pettingill & Cunningham. (See Washington, D. C., United States Fish Commission.)

Pfeil, John. Two fossils and two copper spear-heads; from Wisconsin.

Philadelphia, Zoological Society of, A. E. Brown, Superintendent. Specimen in flesh of Barbary Wild Sheep (*Ovis tragelaphus.*)

Phillips, D. A. Box of remains from Indian tumuli in Pennsylvania.

Phillips, J. P. Specimens of smelt; from Hancock County, Maine.

Pengry, John T. Tarpum (*Megalops thrissoides*); from Long Branch, N. J.

Poey, Prof. Felipe. Collection of turtles and fishes stuffed and dried; from Cuba.

Polsen, Alfred. (See Washington, D. C., United States Fish Commission.)

Porter, H. H. Specimens of artificially raised lake-, brook-, and salmon-trout.

Porter, Dr. J. Y., U. S. A., and Mr. Moore, Keeper of Loggerhead Light, Florida. Collection of fishes; from the Dry Tortugas, Florida.

Potter, Thomas. Specimens of clay from 60 fathoms deep in Long Island Sound.

Powel, Hon. Samuel. Collection of marine fishes; from Newport, R. I.

Preston, D. A. Box of lead and zinc ores; from Joplin, Mo.

Princeton, N. J., College of New Jersey. Casts of stone implements.

Pringle, O. M. Specimens of mineral; from Oregon.

Purman, D. Gray. Specimens of lead and zinc ores.

Putnam, Thomas J. Two "fool-fish" (*Pleuronectes glaber*); from Salem, Mass.

Queensland Acclimatization Society, Australia, Lewis A. Bernays, Vice-President. Sponge gemmules from river in Western Australia.

Quinlion, J. W. Teeth of fossil elephant, horse, and shark; from Bull River, South Carolina.

Radcliffe, William H. (See Washington, D. C., United States Fish Commission.)

Randle, Prof. E. H. Box of stone relics and minerals; from Kentucky.

Rau, Charles. Cast of ceremonial spear-head, from Saint Clair County, Illinois; and bat (*Vespertilio*), from Washington, D. C.

Reed, M. C. Specimen of shell conglomerate; from Ohio.

Reed, Thomas. Living iguana; from Navassa, West Indies.

Reid, A. J. Specimens of fish (*Notemigonus chrysoleucus*); from the Fox River, Wisconsin.

Reynolds, A. M. Specimens of minerals.

Reynolds, Elmer R. Two boxes of fossils, fragmentary pottery, and arrow-heads; from Virginia.

Reynolds, J. H. Collection of stone relics and pottery; from West Virginia.

Rhodes, B. V. Large bug; from Indiana.

Rich, Capt. A. F., Boston, Mass. (See Washington, D. C., United States Fish Commission.)

Richmond, A. G. Cast of Indian stone ornament.

Ridgway, Robert. Four boxes of general natural-history specimens; principally from Illinois.

Riley, William. (See Washington, D. C., United States Fish Commission.)

Roach, David. (See Washington, D. C., United States Fish Commission.)

Robbins, Elisha. String of cells of periwinkle.

Roberts, N. E. Four living turtles (*Cistudo*); from Fairfax County, Illinois.

Roessler, A. R. Specimens of jasper; from North Carolina.

Rogers, ———. Samples of various kinds of fish-glue.

Romig, Rev. B. Two boxes of shells, fossils, and woods; from Antigua, West Indies.

Ronex, W. J. Tail of milk-snake (*Coluber eximius*).

Roop, C. Five small arrow-heads; from Oregon.

Ross, A. C. Three boxes of Indian stone relics; from Ohio.

Rosser, B. R. (through Rev. F. B. Scheetz). Part of flint ceremonial implement; from Missouri.

Rowe, George T. (See Washington, D. C., United States Fish Commission.)

Rowe, Capt. John. (See Washington, D. C., United States Fish Commission.)

Rowe, Timothy S. (See Washington, D. C., United States Fish Commission.)

Rust, Miss Carrie A. (See Washington, D. C., United States Fish Commission.)

Rust, H. N. Cast of Franklin on Ring cent of the United States, 1787.

Rust, John R. Double-headed lamb.

Russia. Herbarium of Botanic Gardens, St. Petersburg, C. J. Maximowicz, Director. Over two hundred species of Japanese plants.

Ruth, Dr. M. L., U. S. N. Collection of alcoholic reptiles and fishes; from the Madeira River, Brazil.

Sale, C. J. Beetle; from Virginia.

Sammis, Col. J. S. Specimen of living snake (*Abastor erythrogrammus*); from Florida.

Sandvik Iron and Steel Works, Sweden. Collection of manufactured iron and steel, being their exhibit at the International Exhibition, 1876, at Philadelphia.

Sanford, H. G. Fossiliferous boulder; from George's Banks.

Sargent, Senator A. A. Box of fossils; from California.

Saunders, Howard. Five skins of gulls and terns; from Europe.

Savage, Joseph. Box of invertebrate fossils; from Kansas.

Sayler, Marcus. Collection of Indian stone implements; from Ohio and Illinois.

Sayward, E. P., jr. (See Washington, D. C., United States Fish Commission.)

Schanno, Joseph. Sample of fir-sugar; from Washington Territory.

Schneck, Dr. J. A large collection of living turtles and terrapins, and a box of water-plants; from Illinois.

Scott, George W. (See Washington, D. C., United States Fish Commission.)

Scupham, J. R. Small reptile; from Kern County, California.

Sells, P. R. Box of stone implements and pottery; from Georgia.

Sennett, George B. A collection of bird-skins; from Fort Brown, Texas.
Serviss, E. F. Box of ethnological specimens; from Kansas.
Shelby, D. Parasphenoid bone of alligator-gar.
Shemelin, Joseph P. (See Washington, D. C., United States Fish Commission.)
Shemelin, James C. (See Washington, D. C., United States Fish Commission.)
Shindler, A. Z., and *George H. Boehmer.* Large stone axe; from Virginia.
Sibley, H. F. Specimens of stone implements; from Illinois.
Silva-Terra, Anton. (See Washington, D. C., United States Fish Commission.)
Simons, Capt. A. (See Washington, D. C., United States Fish Commission.)
Singleton, John. Copper chisel; from Illinois.
Small, George. Specimens of alewives; from Bucksport, Me.
Small, E. E. Specimen of "spinous shark" (*Echinorhinus spinosus*); from Provincetown, Mass.
Smith & Oakes. (See Washington, D. C., United States Fish Commission.)
Smith, Douglas B. Specimens of shells and beads; from Evanston, Ill.
Smith, Jacob. Skin of Wilson's phalarope (*Phalaropus wilsonii*); from Manitoba.
Smith, James A. Series of manufactured clay tobacco-pipes.
Smith, Prof. H. L. Four alewives (*Pomolobus vernalis*); from Geneva, N. Y.
Smith, John L. (See Washington, D. C., United States Fish Commission.)
Smith and Oakes. Specimen of yellow cod (*Gadus morrhua*); from Gloucester, Mass.
Snyder, T. W. Five invertebrate fossils; from Illinois.
Sorensen, John P. Specimen of ore; from Utah.
Southwick, J. M. K. Two samples of codfish-hooks.
Soutter, August. Case of mounted birds and photographs.
Spalding, R. M. (through *Rev. F. B. Scheetz*). Two stone axes; from Missouri.
Sperry, Mrs. James L. Eight skins of California birds.
Spurr, Captain. (See Washington, D. C., United States Fish Commission.)
Stabler, J. P. Specimens of living snakes; from Maryland.
Stanske, Charles. Copper nodule and stone axe; from Wisconsin.
Staples, Edwin B. Two boxes Indian relics, one box turtles (*Pseudemys mobiliensis*), and shell mouth-peg; from Florida.
Stearns, Silas. Ten boxes of specimens of fish and shell, including type of new fish, *Caulolatilus microps* Goode & Bean; from Florida.

Steele, W. N. Living snake (*Ophibolus doliatus doliatus*); from Maryland.

Stevens, James A. Collection of shells; from Summit County, Ohio.

Stewart, W. E. Five shad (*Alosa sapidissima*); specimen of *Elops saurus;* from the Potomac River.

Stone, Livingston. Large collection of alcoholic fishes, from the McCloud River, California; also, one box fossils, from California.

Story, L. D. (See Washington, D. C., United States Fish Commission.)

Stout, W. C. Branchial apparatus of *Lepidosteus.*

Studley, Edwin. Grooved stone axe; from Wisconsin.

Sumner, M. T., jr. Sections of oak showing old surveyor's marks.

Sutherland, John. Specimen of land-locked salmon (*Salmo salar*, var. *sebago*); from the Merrimac River.

Swan, James G. Collection of fishes, in alcohol; and specimens of bone implements used by the Haidah Indians; from Washington Territory.

Sweden. Academy of Sciences, Stockholm. Ten species of shells; from Nova Zembla.

Sweeney, Frank. (See Washington, D. C., United States Fish Commission.)

Sweet, Capt. William E. (See Washington, D. C., United States Fish Commission.)

Symmes, Rev. Francis M. Box of ethnological specimens; from Orange County, Indiana.

Tarr, Capt. James. (See Washington, D. C., United States Fish Commission.)

Tarr, James G. (See Washington, D. C., United States Fish Commission.)

Tatham & Co., New York. Bag of "dust" shot.

Taylor, Rev. Horace J. Collection of shells, beetles, and ethnological specimens; from the Gilbert and Marshall Islands.

Thompson, Capt. William. (See Washington, D. C., United States Fish Commission.)

Thompson, W. H. Mass of quartz crystals; from Tye River, Virginia.

Thomson, J. H. Crab taken from hold of the bark Osprey, New Bedford, Mass.

Thorpe, Rev. Thomas M. Wing and bill of woodpecker and four hickory-nuts; from Arkansas.

Tobey, Gerard C. Squilla; from Buzzard's Bay, Rhode Island.

Toellner, A. Fragments of human skull and pottery; from mound in Illinois.

Towers, David. Living slug; from Washington, D. C.

Towner, Wayne. Gypsum; from Pennsylvania.

Tresilian, Thomas. (See Washington, D. C., United States Fish Commission.)

Triece, W. G. Specimens of snake and turtle; from Pennsylvania.

Turner, C. W. S. Four arrow-heads; from Virginia.

Turner, L. M. Turtle (*Malacoclemmys peudo-geographicus*); from Southern Illinois.

Turner, Mrs. M. E. Three boxes of living turtles; from Southern Illinois.

Turkey. Robert College, Constantinople. Collection of bird-skins.

Van Dyck, W. T. Three boxes of general natural-history collections; from Syria.

Van Hook, J. C. Snake (*Coluber obsoletus obsoletus*); from Virginia.

Vance, James A. Mineral; from Arkansas.

Velie, Dr. J. W. Collection birds' eggs and shells, from Florida; cast of stone axe, two living turtles and living snake, from Illinois.

Voss, A. (See Washington, D. C., United States Fish Commission.)

Wade, Joseph M. Pectoral of flying-fish, taken in the South Pacific Ocean.

Walker, Dr. R. L. Four living hell-benders (*Menopoma alleghaniensis*); from Western Pennsylvania.

Wallace, James B. Insect; from Texas.

Wallace, John. Two Australian parrakeets.

Wallis, Dr. G. B. Specimens of fossils and copper ore.

Walton, W. B. Oyster with double shell.

Washington, D. C.:

Department of State, U. S. A. (See under name of *Hon. G. A. Williamson*, United States minister to Guatemala.)

Treasury Department, U. S. A.:

United States Revenue-Marine. (See under name of *Capt. Alfred B. Davis.*)

United States Coast Survey. (See under name of *W. H. Dall.*)

War Department, U. S. A.:

United States Army. (See under names of *General M. C. Meigs, Col. A. G. Brackett, Lieut. George M. Wheeler*, and *Lieut. J. P. Jefferson.*)

Surgeon-General's Office, United States Army Medical Museum (*Dr. G. A. Otis, in charge.*) A collection of bird and mammal skins, fossils, ethnologica, &c., collected in Texas by *Dr. R. H. White*, U. S. A. (See also under the names of *Drs. J. Y. Porter, W. Whitney, T. E. Wilcox*, and *H. C. Yarrow*, medical officers United States Army.)

Surveys west of the one hundredth meridian, Lieut G. M. Wheeler in charge. Collection of mortars and pestles, pottery, arrows, quivers, &c., also a large collection of plants; from Arizona and California.

Bureau of Ordnance, General S. V. Benét. Specimens of copper-ore from Rock Island, Ill.

Signal Service, United States Army. (See under name *Private E. W. Nelson.*)

Washington, D. C.—Continued.

Navy Department, U. S. A.:

Bureau of Navigation, Commodore Whiting in charge; 63 bottles of soundings made by the United States steamer Tuscarora.

Surgeon-General's Office. (See under names of *Drs. M. L. Ruth* and *Robert Whiting, medical officers United States Navy.*)

Agricultural Department, U. S. A., Hon. W. G. Le Duc, Commissioner:

Two pairs of antlers of Virginia deer; sucker-fish (*Catostomus*) from Alabama.

Interior Department, U. S. A.:

General Land Office. (See under the names of *Surveyors-General Roswell, H. Mason* and *John Wasson*; also under name of *P. W. Norris, superintendent Yellowstone National Park.*)

United States Commission of Fish and Fisheries. (*Prof. Spencer F. Baird, Commissioner.*) About 100 boxes zoological collections from Gloucester, Mass., and vicinity, made by *Prof. A. E. Verrill, G. Brown Goode,* and *Tarleton H. Bean.* (See also under names of *Charles G. Atkins, Tarleton H. Bean, H. C. Chester, F. N. Clark, Vinal N. Edwards, G. Brown Goode, James W. Milner,* and *Livingston Stone.*) Specimens have also been obtained by the commission from the following parties:

Anderson, Capt. Charles, and crew of schooner Alice G. Wonson. A collection of fishes, corals, shells, sponges, &c.; from George's Bank.

Atkinson, John. Skull of codfish (*Gadus morrhua*); malformed claw of lobster (*Homarus americanus*).

Allen, George K., schooner Marion. Specimen of gold-banded rush-coral (*Keratoisis ornata*).

Allen, George K., schooner M. H. Perkins. Collection of corals, sponges, sea-feathers, and fishes; 40 miles southwest of Sable Island.

Anderson, Capt. Chris, schooner Solomon Poole. A large and interesting collection of living hydroids, bryozoans, sponges, &c.; from 15 miles off Pollock Rip Light-Ship.

Andrews, F. S. Specimen of spider-crab brought in by schooner Clara B. Sweet from Middle Bank.

Babson, Fitz J. Specimen of "old wife" (*Harelda glacialis*) shot in Squam River, and axis of coral.

Babson, Fitz J., jr. Lobster (*Homarus americanus*), with deformed claw.

Babson, William H., schooner Marion. Axis of coral (*Primnoa reseda*), from Banquereau.

Baker, Captain, schooner Peter D. Smith. Specimen of young dog-fish (*Squalus americanus*), lump-fish (*Cyclopterus lumpus*), &c.

Bansett, William A., New Bedford, Mass. Pilot-fish (*Naucrates ductor.*)

Bartlett, A., New Bedford, Mass. Rabbit-fish (*Tetrodon lævigatus*); from Buzzard's Bay.

Bates, James. Rough swell-fish (*Chilichthys turgidus*).

Blackburn, Capt. William, schooner Charles Carroll. Part of skull of whale covered with bryozoans and sponges; from western part of George's Bank.

Blatchford, Capt. B. F. Specimen of bush-coral (*Primnoa reseda*); from Banquereau.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Brazier, Benjamin S. String of eggs of *Sycotyphus canaliculatus*, from Monomy Beach; and pebbles from Steelwagen's Bank, covered with bryozoa.

Briggs, Captain, schooner City of Gloucester. Samples of fish-oil made on the Grand Bank.

Brown, William, schooner Marion. Three specimens of black dog-fish new to the coast.

Burbank, Martin. Young lobster (*Homarus americanus*); from Monhegan Island.

Burke, Henry E., schooner Hattie S. Clark. Bryozoans and sea-corn; from the Grand Bank.

Burns, Thomas. Specimens of gull (*Larus delawarensis*) and star-fish (*Hippasteria*), from off Gloucester; specimens of chimæra and lancet-mouth (*Alepidosaurus ferox*); from George's Bank.

Butler, Isaac, schooner Esther Ward. Specimens of star-fish, sponges, &c.; from Brown's Bank.

Calderwood, Capt. M. W., schooner Jennie M. Calderwood. Perforated rocks with sponges and shells attached; from Western Bank, 68 fathoms.

Capron, John, schooner Solomon Poole. A large and beautiful collection of branching bryozoan corals; from the Grand Banks.

Carlsen, Arnold, schooner Alice G. Wonson. Specimen of rush-coral (*Acanella*); from between Brown's and George's Bank.

Carritt, William, schooner Mary E. Shell new to America; from Flemish Cap.

Carroll, Capt. Daniel. Skua gull (*Stercorarius skua*); from George's Bank.

Cavener, Nicholas, schooner Marathon. *Chalina* sponge and dog-fish skins; from George's Bank.

Childs, Edward R., schooner Mary F. Chisholm. Young green turtle (*Chelonia mydas*); from SE. Le Have.

Clark, Benjamin, schooner Water Sprite. Vase-shaped sponge (*Phakellia*); from Brown's Bank.

Clinton, Capt. George T., schooner Henry Wilson. Barnacles, bryozoans, sea-corn, &c.; from Grand Bank.

Colby, Capt. Charles. Pipe-fish (*Syngnathus* sp.) and star-fish (*Hippasteria phrygina*); taken eight miles off Gloucester.

Collins, Capt. Joseph W., schooner Marion. A large and very valuable collection of fishes, sponges, shells, and other marine animals, many of which are new both to the American fauna and to science.

Collins, William. Jaws of shark caught off Monhegan Island.

Conley, John. Specimens of finger-sponge (*Chalina*) and mackerel-shark (*Lamna cornubica*); from off Gloucester.

Cressy, Charles C. Specimens of oceanic dolphin (*Coryphæna punctulata*); from the Grand Bank.

Cunningham & Thompson. Very large sponge; from Le Have Bank.

Curtis, Capt. Andrew, ship Ida Lily of Richmond. Pens of squid (*Sepia*), from Cadiz Bay; larval lobster (?); fossiliferous rock; from George's Bank.

Danforth, John. A large sea-worm.

Davis, Mrs. Abby L. Fossiliferous rock; from George's Bank.

Davis, Mrs. Mary E. Fossiliferous bowlder; from Banquereau.

Demsey, Capt. William, schooner Everett Steele. Parasites of codfish (*Egapsora*); from George's Bank.

Devan, James, schooner Flying Scud. Base of coral; from Eastern George's.

Devoe, Capt. Luke, schooner Epes Tarr. Branching bryozoans and sea-corn, from Grand Bank.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Dixon, Eugene F., schooner William T. Smith. Hydroids and Bryozoa; from 15 miles off Virgin Rock.

Dixon, Capt. George W., schooner William T. Smith. Bryozoans and sea-corn; from George's Bank.

Douglass, Capt. George, schooner Constitution. Specimens of lump-fish, dollar-fish, rock-eel, moon-fish, &c., and a crustacean (*Idotea robusta*); from Casco Bay.

Douglass, John, specimen of ribbon-snake (*Eutænia saurita*).

Douglass, Robert, 2d. Specimen of phantom-eel (*Leptocephalus*); from off Gloucester.

Driscoll, Daniel, schooner Solar Wave. Bush coral; from Banquereau.

Dulaney, John. Rare holothurian; from off Gloucester.

Duncan, Capt. J. F., schooner Mary Low. A very large sponge; from Sable Island Bank.

Floyd, Joseph D. Fossiliferous boulder and rock perforated by *Saxicava arctica;* from George's Bank.

Friend, Sidney. Same as above.

Gaffney, William M. Rock covered with barnacles and bryozoans and fossiliferous boulder; from George's Bank.

Getchell, Capt. John Q., schooner Otis P. Lord. Specimens of fish, sponges, corals, &c., two living hagdons, shells; from George's and Brown's Banks, and Cape Cod.

Ginnevan, Thomas, and Philip Merchant. Two very large spider-crabs (*Lithodes maia*).

Goodwin, Capt. Thomas, schooner Elisha Crowell. Coral (*Acanthagorgia*), from Western Bank; eyes of fishes, coral, and sponge, from Sable Island Bank; lancet-mouth (*Alepidosaurus ferox*), from Le Have Bank.

Goodwin, Thomas, schooner Bellerophon. Limestone rock containing fossil shells (*Cyprina*); from Grand Bank.

Gorton, Slade, & Co. Specimens of "red" salted swordfish and codfish.

Goslin, Capt. Joseph, schooner Shooting Star. Chalina sponge; 25 miles southeast of Sankaty Head.

Gourville, Capt. John, schooner Rebecca Bartlett. Specimens of fish (*Anarrhichas lupus, Triglops, Sebastes*), shells, star-fish (*Crossaster papposus*), sponges (*Chalina, Isodictya*), crabs, bryozoa, &c., &c.; from George's Bank.

Greenleaf, Capt. William H., schooner Chester R. Lawrence. Specimens of fish (*Haloporphyrus viola, Synaphobranchus pinnatus, Petromyzon,* &c.), great northern sea-feather (*Pennatula borealis*), corals (*Flabellum, Acanthomastus, Acanthagorgia*); from George's Bank.

Hamlen, Capt. Peter, schooner Andrew Leighton. Wolf-fish (*Alepidosaurus ferox*) and pug-nosed eel; from George's Banks.

Harvey, Edward, schooner Rebecca Bartlett. Small crustacean (*Idotea robusta*); from George's Bank.

Haskell, Samuel. Fossiliferous boulder brought by schooner Conductor, Captain Curtis; also, bryozoans and fossiliferous boulder from Grand Bank, brought in by schooner Etta E. Turner, Captain Olsen.

Hawkins, Capt. James, schooner Gwendolen. Basket star-fish, black rudder-fish (*Palinurichthys*), slime-eel (*Myxine*), crabs, shells, &c.; from Saint Peter's and Le Have Banks.

Hawkins, Capt. Z., schooner Gwendolen. Fishes (*Zoarces, Petromyzon, Synaphobranchus,* &c.), embryo sharks, star-fishes, crabs; from George's Bank.

Herring, Richard, schooner William H. Raymond. Large gray gannet (?) and fossiliferous rocks; from NE. George's Bank.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Hewitt, Isaac S., schooner J. J. Clark. Large bunch of barnacles (*Balanus porcatus*); from Middle Bank.

Higgins & Gifford. Model of a Gloucester fish-wharf and houses.

Hillier, Fred., schooner Alice M. Williams. Two rare species of eel-like fishes and bush-coral (*Acanella normani*) with basket-fish attached.

Hodgdon, Capt. T. F., schooner Bessie W. Somes. Collection of corals (*Acanella normani*), sponges, sea-feathers (*Pennatula borealis, P. aculeata, Balticina, Finmarchicha*), shells, &c.; from Sable Island Bank.

Hodgkins, Edward W. Crabs (*Leithodes maia* and *Cancer irroratus*); from Gloucester.

Homans, Capt. Charles A. Specimens of Sipo wood used by the Carib Indians, of South America, for intoxicating and catching fish. Specimens of codfish from the West Indian market.

Hoy, George W., schooner Mary F. Chisholm. File-fish (*Balistes capriscus*) and axis of sea-pen; from Le Have Bank.

Hurlbert, Capt. R. H. Eggs of periwinkle, from Cape Henlopen; Gunther's midge (*Hypsiptera argentea*), from off Cape May; shells of scallop and herring-spawn from George's Bank.

Jameson, John S., schooner Henry Wilson. Bryozoans, scallops, and sea-corn; from Grand Bank.

Jellow, John, schooner Laura Nelson. Fragments of gold-banded rush-coral (*Keratoisis ornata*); from Le Have Bank.

Jellow, John H., schooner George P. Whitman. Specimens of coral (*Acanella normani, Primnoa reseda*), snails (*Lunatia*), and scallops (*Pecten*); from Le Have and George's Banks.

Jewett, Capt. Thomas, schooner City of Gloucester. Specimens of sponge, fan-shaped and gold-banded corals, sea-pens (*Pennatula*), &c.; from Le Have Bank.

Johnson, Capt. George A., schooner Augusta Johnson. A large and interesting lot of rare fishes, including the grenadier (*Macrurus Fabricii*), chimæra (*Chimæra plumbea*), black dog-fish (*Centroscyllium* and *Centroscymnus*), wolf-fish (*Anarrhichas lupus*), (*Synaphobranchus*), shells, sponges &c.; from Sable Island and George's Banks.

Johnson, Capt. Peter. Collection of shells, star-fishes, sea-cucumbers, &c.; from George's Bank.

Kearney, William, schooner Marathon. Chalina sponge; from George's Bank.

Kilpatrick, Capt. Briggs, schooner City of Gloucester. A rare sucker-fish (*Remoropsis brachyptera*) taken from the gills of a swordfish.

King, W. A., schooner Otis D. Dana. Bush-coral (*Primnoa reseda*); from George's Bank.

Kippin, John, schooner Solomon Poole. Chalina sponge, and stones bored by *Saxicava arctica;* from Grand Bank.

Lakeman, J. Spider-crab (*Leithodes maia*).

Larkin, John, schooner George W. Stetson. Young hagdon, living.

Le Blanc, Simon, schooner Rebecca Bartlett. Star-fish (*Crossaster papposus*); from George's Bank.

Lloyd, J. D. Stones bored by *Saxicava arctica*, fossils, &c.; from George's Bank.

Lundberg, John A. Sponge (*Chalina aculeata*); from George's Bank.

McCallum, George, schooner Fitz J. Babson. Specimen of the King-of-the-herring (*Chimæra plumbea*); from Le Have Bank.

McDonald, Duncan, schooner Polar Wave. Specimens of coral and "turbot" (*Platysomatichthys hippoglossoides*); from Eastern Banquereau.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

McDonald, James and John D., schooner Addison Center. Old-fashioned iron kettle; hauled up on trawl near Halifax, N. S.

McDonald, Capt. Jerome, schooner G. P. Whitman. Rare barnacles and King-of-the-herring (*Chimæra plumbea*); from Le Have Bank; two specimens of lancet-mouth (*Alepidosaurus ferox*); from George's Bank.

McDonald, Capt. Matthew, schooner Lizzie K. Clark. Specimens of rare fish (*Chimæra plumbea, Synaphobranchus pinnatus*), corals (*Keratoisis, Acanthagorgia, Acanella*), shells, sponges, sea-feathers, &c.; from Western and Sable Island Banks.

McDonald, Miles. Sea-mouse (*Aphrodite aculeata*); from Middle Bank.

McDonald, Capt. William, schooner N. H. Phillips. Five specimens of coral (*Acanella normani*); from SE. Le Have Bank, and one (*Paragorgia*) from Seal Island Bank.

McEachern, Daniel, schooner Guy Cunningham. Bases of fan-shaped coral taken on Grand Bank; and specimens of eels (*Myxine and Petromyzon*); sponges and sea-anemones; from George's Bank.

McEntire, Daniel. Gypsum; from mouth of Saint Lawrence River.

McGinnis, Captain, schooner M. H. Perkins. Black dog-fish (*Centroscymnus cœlolepis*); from Sable Island Bank.

McKinnon, Capt. Daniel., schooner Mary F. Chisholm. Specimens of fish (*Myxine, Sebastes Petromyzon*), crabs, corals, &c.; from Sable Island and Le Have Banks.

McKinnon, Capt. John, schooner R. B. Hayes. Spider-crab (*Leithodes maia*); from 25 miles off Gloucester, SE.

McPhee, Capt. N., and crew, of schooner Carl Schurz. Specimens of corals (*Alcyonium, Flabellum, Acanella*), sea-feathers, star-fish, parasites of halibut (*Æga psora*), &c.; from near Sable Island Bank.

McQuinn, Edw. Specimens of *Remoropsis brachyptera;* brought in by schooner W. H. Perkins from Grand Bank.

McQuinn, Michael, schooner N. H. Phillips. Rare shells (*Aporrhais*), and eggs of shark; from George's Bank.

Madden, Henry F. Axis of tree-coral (*Primnoa reseda*); from off Sable Island.

Mansfield, James, & Sons. Fossiliferous boulder; from George's Bank.

Marble, Frank. Large finger-sponge (*Chalina*), King-fish (*Menticirrus nebulosus*), and fish-spawn; from Norman's Woe.

Martin, Capt. George H., schooner Northern Eagle. Specimens of fish, crustacea, barnacles, hydroids, &c., from between Boone Island and Matinicus Rock, swordfish (*Xiphias gladius*); taken off Portland, Me. (purchased); 5 swords of swordfish from South Channel; pipe-fish (*Syngnathus fuscus*); from Provincetown, Mass.

Martin, Capt. S. J. Living specimen of hagdon (*Puffinus anglorum*); from George's Bank.

Mason, Peter. Shells and hydroids taken by crew of schooner Hattie S. Clark on Grand Bank.

Meek, James, schooner Alice G. Wonson. Specimen of tree-coral (*Paragorgia arbuscula*); from between Brown's and George's Banks.

Menezer, Joseph. Herring-gull; from Gloucester, Mass.

Merchant, George, jr., schooner Hattie B. West. A small goose-fish (*Lophius piscatorius*) taken off Cape Elizabeth.

Merchant, Philip, schooner Marion. Specimens of coral (*Mopsia, Keratoisis,* and *Acanella*); from 30 miles off Sable Island.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Moore, H. C., schooner Chester R. Lawrence. Tusk of walrus; found on the east coast of Newfoundland.

Morrissey, Capt. Daniel C., schooner Alice M. Williams. Two specimens of bush-coral (*Acanella normani*); from the Western Bank.

Morrissey, Capt. James D., schooner Alice M. Williams. Specimens of fish (*Chimæra plumbea, Centroscymnus cœlolepis, Petromyzon*) and coral; from George's Bank.

Morrison, Capt. R. N., schooner Laura Nelson. Lamper-eel (*Petromyzon*) and fragments of tree-coral (*Paragorgia arborea*); from Le Have Bank.

Murphy, J., schooner Gertie Foster. A beautiful sponge; from George's Bank.

Murphy, Michael J., schooner Magic. Specimen of tree-coral (*Paragorgia arborea*); from Grand Bank, and bush-coral (*Acanella normani*); from Banquereau.

Murphy, Capt. Nicholas, schooner Franklin S. Schenck. Pebbles covered with bryozoans; from Whaleman's Shoal off Nantucket.

Nolan, Joseph, schooner Bessie W. Somes. Specimen of bush-coral (*Primnoa reseda*); from Banquereau.

Olsen, Capt. Chris., and crew, schooner William Thompson. Specimens of sea-mouse (*Aphrodite*) star-fish, hydroids, bryozoans, &c.; from Grand and Le Have Banks.

Parsons, John. Young pipe-fish (*Syngnathus fuscus*).

Parsons, William. Specimen of snipe-eel (*Nemichthys scolopaceus*); taken by schooner Howard Steele, on George's Bank in 1875.

Pearce, F. A. Specimens of fish, star-fish, shells, &c.; from Western Bank.

Peterson, Martin, and *Dennis Theleueng, schooner William Thompson.* Specimens of rare fish (*Alepidosaurus ferox, Macrurus Fabricii, Centroscymnus cœlolepis*) and coral; 39 miles off Sable Island.

Peterson, M. R., schooner Guy Cunningham. Specimen of gold-banded rush-coral (*Keratoisis ornata*) with barnacles attached, &c.

Pettingell & Cunningham. Fossiliferous boulders bored by *Saxicava;* from George's Bank.

Polsen, Alfred, schooner Mary E. Hat-sponge from Flemish Cap.

Radcliffe, William H., yacht Uncle Sam. Sea-lemon (*Boltenia*); from off Gloucester, Mass.

Rich, Capt. A. F., Boston, Mass. Specimen of sucker-fish (*Remoropsis brachyptera*); from South Channel.

Riley, William, schooner Grace C. Hadley. Living fulmar-petrel; from George's Bank.

Roach, David, schooner Lizzie K. Clark. Tobacco-pipe made from axis of tree-coral.

Schooner Alice G. Wonson. Lancet-mouth (*Alepidosaurus ferox*), corals (*Paragorgia arborea, Flabellum articum, Primnoa reseda*), star-fishes, shells, &c.; from between George's and Le Have Banks.

Schooner Carl Schurz. King-of-the-herring (*Chimæra plumbea*) and bush-coral (*Acanella normani*); taken 30 miles south of Sable Island; also sword of swordfish.

Schooner Charger. Specimen of spider-crab (*Leithodes maia*); from Marblehead Bank.

Schooner G. P. Whitman. Rock covered with bryozoans; from Banquereau.

Schooner Grace C. Hadley. Stone covered with barnacles and bryozoa; from George's Bank.

Schooner Howard Holbrook. Scallop-shells; from Grand Bank.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Schooner Josie M. Calderwood. Perforated rocks with sponges and shells adhering; from George's Bank.

Schooner Lizzie K. Clark. Shells of *Buccinum cyaneum;* from 30 miles south of Sable Island.

Schooner Northern Star. Three living hagdons (*Puffinus anglorum*); from Grand Bank.

Schooner Otis P. Lord. Collection of star-fishes (*Crossaster papposus*), barnacles, sea anemones, &c.

Schooner Phœnix. Skin of spear-fish (*Tetrapturus albidus*); taken in the South Channel.

Schooner Rebecca Bartlett. Tail of swordfish (*Xiphias gladius.*)

Schooner Wachusett. Collection of scallops, hydroids and barnacles; from Grand Bank.

Rowe, George T. Specimen of *Zoarces;* from off Gloucester.

Rowe, Capt. John. Specimen of bush-coral (*Primnoa reseda*); from Banquereau.

Rowe, Timothy S. Specimen of "gulf-weed;" from the Gulf Stream.

Rust, Miss Carrie A. Barnacles (*Lepas fascicularis*); from Harpswell, Me.

Sayward, E. P., jr. Fossiliferous rocks; from George's Bank.

Scott, George W., schooner Lizzie. Collection of rare fishes (*Centroscyllum Fabricii, Centroscymnus cœlolepis, Chimæra plumbea*), shells, sponges, corals, &c.; from Banquereau.

Scott, George W., schooner Edwin C. Dolliver. Specimens of fish (*Haloporphyrus, Anarrhichas, Phycis, Synaphobranchus, Chimæra*), devil fish (*Octopus Bairdii*), corals (*Alcyonium, Keratoisis*), sea-feathers (*Pennatula, Balticina*), shells, &c.; from lat. 43° 23′, long. 60° 16′.

Scott, George W., schooner City of Gloucester. Sample of black-dog-fish oil.

Shemelia, Joseph P., schooner William H. Raymond. A large collection of living water-birds, five species; from NE. George's Bank.

Shemelia, James C., schooner William H. Raymond. Chalina sponge, barnacles, hydroids, and bryozoans; from George's Bank.

Silva-Terra, Anton, schooner Rebecca Bartlett. Specimens of dog-fish skin.

Simons, Capt. A., schooner Defiance. Living specimen of sea-robin (*Prionotus*); from the Brewsters.

Smith, John L. Specimens of sea-corn taken by schooner Conductor on Grand Bank; also tree-coral from George's Bank.

Smith & Oakes. Fossiliferous boulder bored by *Saxicava;* from George's Bank.

Spurr, Captain, schooner John F. Wonson. Muscles, hydroids, bryozoans, &c.; from George's Bank.

Story, L. D., Magnolia. Small fish (*Argyreiosus vomer*); from Magnolia.

Sweeney, Frank. Parasites from gills of codfish taken off Gloucester.

Sweet, Capt. William E., schooner Grace C. Hadley. Sea-cucumber (*Thyonidium Dubenii*), star-fish, and parasites of cod (*Ægа psora*); from George's Bank.

Tarr, Capt. James. French hooks taken from the stomach of codfish on shoal ground off Salvages in 1856 and Jeffries Ledge, 1876.

Tarr, James G. Samples of fish-oil.

Thompson, Capt. William, schooner Magic. Collection of corals, sponges, sea-feathers, shells, &c.; from Sable Island Bank and Banquereau.

Tresilian, Thomas. Tree-coral (*Primnoa reseda*); from George's Bank.

Voss, A. "Devil's claw," or box-hook used in boxing halibut.

Washington, D. C.—Continued.

U. S. Commission of Fish and Fisheries—Continued.

Webb, Capt. Henry, Rockport. Specimens of pollock, whiting, and Greenland sculpin; from Milk Island, Rockport. Also, lobster-pot bait-hook.

Wells, Capt. William N., schooner E. B. Phillips. Shells from Grand Bank.

Welsh, Capt. James, schooner Martha and Susan. Specimen of chalina sponge; from George's Bank.

Welsh, Morris. Specimen of chalina sponge; from George's Bank.

Whiting, Henry, schooner Webster Sanborn. A large collection of shells (*Pecten islandica, Rhynchonella*, sp.); from Grand Bank.

Whitman, George P., Rockport. Mounted specimens of Richardson's jæger-gull (*Stercorarius parasiticus*).

Williams, Capt. B. A., schooner Centennial. Scallop shell and pebbles with barnacles, bryozoans, and sea-corn adhering.

Wilson, John I., schooner Otis D. Dana. Specimens of pomarine jæger (*Stercorarius pomatorhinus*); from George's Bank.

Wonson, Everett P. A collection of shells, barnacles, corals, &c.; from Newfoundland and George's Bank.

Wasson, John, United States Surveyor-General, Arizona. Collection of ores and minerals from various mines in Arizona.

Watkins, Joseph C. Small collection of fragmentary bones, pottery, arrow-heads, and fine stone pipe; from mound in Missouri.

Webb, Capt. Henry. (See Washington, D. C., United States Fish Commission.)

Wells, Capt. William N. (See Washington, D. C., United States Fish Commission.)

Welsh, Capt. James. (See Washington, D. C., United States Fish Commission.)

Welsh, Morris. (See Washington, D. C., United States Fish Commission.)

Welsher, H. W. Four specimens of whitefish (*Coregonus albus*); from Madison Lake, Wisconsin.

Werner, Johann, children of. Arrow-head and copper nodule; from Wisconsin.

Wheeler, C. Le R. Specimens of stone implements; from New York.

Wheeler, Lieut. George M., U. S. A. (See Washington, D. C., War Department.)

Whitall, Tatum & Co., Philadelphia. Samples of glass jars.

White, Artemas. Copper celt, slate arrow-heads, and minerals; from New York.

Whiting, Henry. (See Washington, D. C., United States Fish Commission.)

Whiting, Dr. Robert, U. S. N. Copper idol; from the valley of the Rimac, Peru.

Whitman, George P. (See Washington, D. C., United States Fish Commission.)

Whitmore, Hon. A. H. Young sturgeon; from Verona, Me.

Whitmore, Joshua. Lamprey; from Bucksport, Me.

Whitney, L. Flint knives, arrow-heads, and stone ax; from Illinois.

Whitney, Dr. W., U. S. A. Stone axe; from New Mexico.
Whittaker, E. E. Three samples of ore; from Oregon.
Wiggins, Fred. B. Living snake (*Heterodon*); from Virginia.
Wiggins, John B. Three boxes of aboriginal soapstone vessels; from Virginia.
Wilcox, Dr. T. E., U. S. A. Bottle of alcoholic reptiles; from Indian Territory.
Wilder, General J. F. Stone figure-head, pipes, and other valuable relics.
Willard, C. C. Fresh specimen of Rocky Mountain sheep; from Wyoming.
Willetts, Joseph C. Two specimens of lake-trout; from Skaneateles Lake, New York.
Williams, Benjamin. Box of stone implements; from Michigan.
Williams, Capt. B. A. (See Washington, D. C., United States Fish Commission.)
Williamson, Hon. G. A., United States Minister, Guatemala. Box of ethnological and geological specimens; from Guatemala.
Wilson, John I. (See Washington, D. C., United States Fish Commission.)
Wilson, W. M. Collection of living reptiles; from Prince George's County, Maryland.
Wiltheis, C. T. Box of stone relics; from Ohio.
Wittman, E. Box of Cincinnati Group fossils.
Wonson, Everett P. (See Washington, D. C., United States Fish Commission.)
Wood, A. S. Civet cat (*Bassaris astuta*); from Oregon.
Wood, Dr. Preston. Specimens of stone implements; from Illinois.
Wood, Dr. William. Specimen of *Lota maculosa;* from Connecticut.
Woodward, A. J. Shell of turtle; from Otter Creek, Florida.
Woolley, C. W. Specimens of the tobacco-worm moth; from Illinois.
Wooster, A. F. Specimens of arrow-heads and eggs of robin and chicken-sparrow.
Wooster, L. C. Package of Upper Cretaceous fossils; from the Cache la Poudre River, Colorado.
Yarrow, Dr. H. C. Mummy of Arapahoe child and surroundings; from Sidney, Nebr.
Zeledon, José C. Six boxes of general natural history and ethnological collections; from Costa Rica.
Unknown. Corals; scales of tarpum, Indian stone tube, amethystine crystal; specimens of mule-killer (*Thelyphonus*); specimen of coal; snake; stone relics from West Virginia; insect; box of fossils from Lawrence, Kans.; fossil plant; living black-snakes (*Bascanium constrictor*); living helgramite; from Virginia.

INTERNATIONAL EXHIBITION.*

1876.

Certificate of Award

To the Smithsonian Institution, for Hon. Thomas Donaldson, Collector.

Collection of Ores.

No. 1.—*Group* 1.

UNITED STATES CENTENNIAL COMMISSION,

(In accordance with the Act of Congress)

Philadelphia, September 27, 1876.

A. T. Goshorn,
Director General.

John L. Campbell,
Secretary.

Jos. R. Hawley,
President.

STATISTICS OF EXCHANGES.

BOXES SENT ABROAD IN 1878.

Country.	Smithsonian exchanges.	Government exchanges.	Total.
AMERICA.	*No. of boxes.*	*No. of boxes.*	
Argentine Confederation	.....	4	4
Brazil	2	2	4
British Guiana	1	.....	1
Canada	.....	4	4
Chili	1	2	3
Hayti	.....	2	2
Mexico	2	2	4
Peru	1	.....	1
Venezuela	1	2	3
ASIA.			
Japan	2	2	4
Syria	1	.....	1
AUSTRALIA.			
New South Wales	1	2	3
New Zealand	2	2	4
Queensland	1	2	3
South Australia	1	2	3
Tasmania	1	2	3
Victoria	2	2	4
EUROPE.			
Belgium	6	2	8
Denmark	6	.....	6
France	40	2	42
Germany	60	17	77
Great Britain	54	4	58
Greece	.....	2	2
Holland	6	2	8
Italy	10	.....	10
Norway	4	2	6
Portugal	3	2	5
Russia	7	2	9
Spain	3	2	5
Sweden	6	2	8
Switzerland	12	2	14

*Omitted from the Report for 1876, page 83.

RECAPITULATION.

Country.	Smithsonian exchanges.	Government exchanges.	Total.
	No. of boxes.	*No. of boxes.*	
America	8	18	26
Asia	3	2	5
Australia	8	12	20
Europe	217	41	258
Total	236	73	309

NOTE.—No. of boxes, 309; bulk, in cubic feet. 2,160; weight, in pounds, 69,220, containing fourteen thousand six hundred and forty-eight miscellaneous packages, of which 60 contained specimens of natural history.

PACKAGES RECEIVED BY THE SMITHSONIAN INSTITUTION FROM EUROPE, &C., FOR DISTRIBUTION IN AMERICA.

	1877.	1878.
ALABAMA.		
Tuscaloosa:		
Alabama University	.....	4
ARIZONA.		
Prescott:		
Territorial Library	1	.....
ARKANSAS.		
Little Rock:		
State Library	.....	10
CALIFORNIA.		
Berkeley:		
University of California	4	.....
Sacramento:		
Agricultural and Horticultural Society	2	.....
California Institution	1	.....
California Institution for the Deaf and Dumb and Blind	1	.....
Geological Survey of California	.....	1
State Agricultural Society	1	1
San Francisco:		
California Academy of Sciences	60	61
California Historical Society	1	.....
Mayor of the city of San Francisco	2	1
Mechanics' Institute	1	.....
Stockton:		
Society of Natural History	1	.....
State Insane Asylum	1	.....
COLORADO.		
Colorado Springs:		
El Paso County Library Association	1	.....
Denver:		
State Library	1	.....
CONNECTICUT.		
Hartford:		
American Philological Association	.....	1
Connecticut Society of Natural History	1	.....
Connecticut State Agricultural Society	1	1
Retreat for the Insane	1	.....
Society of Natural Sciences	.....	1
State Board of Agriculture	1	8
State Library	1	.....
Young Men's Institute	3	2
Watkinson Library of Reference	.....	1
Middletown:		
Hospital for the Insane	1	.....
New Haven:		
American Journal of Science and Arts	39	35
American Oriental Society	19	16
Connecticut Academy of Arts and Sciences	92	119
Sheffield Scientific School	.....	1
Yale College	30	34
DISTRICT OF COLUMBIA.		
Georgetown:		
Georgetown College	7	4
Hillsdale:		
Pioneer School	1	.....

	1877.	1878.
DISTRICT OF COLUMBIA—Continued.		
Washington:		
Agriculture, Department of	107	113
American Medical Association	9	22
Board of Public Schools	.....	1
Botanic Garden	1	.....
Coast Survey	46	61
Census Bureau	6	4
Columbia Institution for the Deaf and Dumb	1	2
Columbian University	3	6
Corcoran Gallery of Art	.....	1
Education, Bureau of	10	6
Engineer Bureau	9	10
Fish Commission	2	5
Geological Survey of the Territories	83	96
Government Hospital for the Insane	1	.....
Hydrographic Office	13	14
Indian Commissioners, Office of the	3	.....
Interior Department	9	10
Land Office	9	7
Library of Congress	32	33
Light-House Board	2	.....
Medical Society of the District of Columbia	1	1
National Academy of Sciences	43	70
Nautical Almanac Office	4	14
Naval Observatory	50	54
Navigation, Bureau of	3	1
Navy Department	2	4
Ordnance Office	2	3
Patent Office	99	120
Paymaster-General, U. S. A	.....	1
Philosophical Society	3	.....
President of the United States	1	.....
Signal Office	26	28
Statistics, Bureau of	13	16
Surgeon-General's Office	88	108
Swedish and Norwegian Legation	2	.....
Treasury Department	1	2
War Department	6	15
GEORGIA.		
Athens:		
University of Athens	1	.....
Augusta:		
Horticultural Society	1	.....
Savannah:		
Historical Society of Georgia	2	5
ILLINOIS.		
Aurora:		
Literary and Historical Society	1	.....
Bloomington:		
Illinois Museum of Natural History	3	.....
Carbondale:		
Southern Illinois Normal University	.....	6
Chicago:		
Chicago Academy of Science	55	78
Chicago Board of Trade	1	.....
Chicago Historical Society	1	.....
Chicago Public Library	14	9
Dearborn Observatory	5	5

Packages received by the Smithsonian Institution, &c.—Continued.

	1877.	1878.
ILLINOIS—Continued.		
Mayor of the city of Chicago	1	.....
National Live Stock Journal	1	.....
Public School Library	.....	5
University of Chicago	.....	4
Elgin:		
Northern Hospital for the Insane	2	.....
Evanston:		
Northwestern University	1	.....
Galesburg:		
Lombard University	1	.....
Jacksonville:		
State Hospital for the Insane	1	.....
Moro:		
American Pomological Society	.....	3
Normal:		
Illinois Natural History Society and Museum	.....	4
Ottawa:		
Academy of Natural Sciences	1	1
Rantoul:		
Rantoul Literary Society	1	.....
Springfield:		
State Board of Agriculture	3	.....
INDIANA.		
Bloomington:		
Indiana University	1	.....
Greencastle:		
Indiana Asbury University	1	.....
Indianapolis:		
Geological Survey of Indiana	.....	10
Historical Society	1	.....
Indiana Horticultural Society	.....	1
Institution for the Education of the Blind	.....	1
Public Library	.....	1
IOWA.		
Burlington:		
Iowa Historical and Genealogical Institute	1	.....
Davenport:		
Davenport Academy of Sciences	15	52
Decorah:		
Norwegian Lutheran College	4	.....
Des Moines:		
Department of Public Instruction	3	.....
State Library	.....	1
Grinnell:		
Grinnell University	.....	1
Iowa City:		
Director Iowa Weather Service	.....	1
Iowa State University	21	18
Laboratory of Physical Science	.....	1
Mount Pleasant:		
Asylum for the Insane	1	.....
KANSAS.		
Baldwin City:		
Baker University	1	.....
Ossawatomie:		
Kansas Insane Asylum	1	.....
Topeka:		
Kansas Natural History Society	1	.....
KENTUCKY.		
Frankfort:		
State Library	1	.....
Hopkinsville:		
Western Lunatic Asylum	1	.....
Lexington:		
Eastern Lunatic Asylum	1	.....
Kentucky University	1	.....
Louisville:		
Mayor of the city of Louisville	1	1
Public Library	3	.....
University of Louisville	5	.....
Russellville:		
Logan Female College	.....	1
LOUISIANA.		
Baton Rouge:		
State University	3	.....

	1877.	1878.
LOUISIANA—Continued.		
Clinton:	1	.....
Louisiana Insane Asylum		
New Orleans:	.....	2
Athenée Louisianais	1	.....
Insane Asylum	1	2
Mayor of the city of New Orleans		
New Orleans Academy of Natural Sciences	8	8
State Library	.....	2
University of Louisiana		
MAINE.		
Augusta:		
Commissioner of Fisheries of the State of Maine	2	1
Maine Hospital for the Insane	1	.....
Natural History and Geological Society	.....	2
State Board of Agriculture	2	.....
Brunswick:		
Bowdoin College	11	4
Historical Society of Maine	7	2
Calais:		
Calais High School and Academy	2	.....
Lewiston:		
Androscoggin Natural History Society	1	.....
Norway:		
High School and Academy	1	.....
Portland:		
Maine Agricultural Society	1	.....
Portland Society of Natural History	28	40
Waterville:		
Colby University	4	3
MARYLAND.		
Annapolis:		
St. John's College	.....	3
United States Naval Academy	7	4
Baltimore:		
Baltimore City College	1	.....
Johns Hopkins University	6	8
Maryland Academy of Science	1	3
Maryland Asylum for the Insane	1	.....
Maryland Historical Society	12	3
Maryland Institute	.....	1
Mayor of the city of Baltimore	2	1
Peabody Institute	7	10
St. Paul's Lyceum and Library Association	4	.....
University of Maryland	1	.....
MASSACHUSETTS.		
Amherst:		
Amherst College	7	6
Andover:		
Theological Seminary	.....	1
Boston:		
American Academy of Arts and Sciences	137	182
American Gynecological Society	.....	4
American Social Science Association	2	.....
American Statistical Association	14	11
American Unitarian Association	1	.....
Board of State Charities	3	.....
Boston Art Club	1	1
Boston Athenæum	3	3
Boston Hospital	1	1
Boston Medical and Surgical Journal	12	11
Boston Microscopical Society	1	....
Boston Society of Natural History	168	166
Bowditch Library	1	4
Department of Public Instruction	.....	1
Institute of Technology	.....	3
Massachusetts Asylum for the Blind	.....	1
Massachusetts Board of Education	1	1
Massachusetts Historical Society	10	2
Mayor of the city of Boston	2	1
Medical and Surgical Journal	3	.....
New England Historic Genealogical Society	6	4
North American Review	1	.....
Public Library	31	30

Packages received by the Smithsonian Institution, &c.—Continued.

	1877.	1878.
MASSACHUSETTS—Continued.		
Science Observer	.....	1
State Board of Agriculture	3	3
State Board of Charities	.....	1
State Board of Health	9	5
State Library	12	7
Cambridge:		
Cambridge Philosophical Society	1	.....
Entomological Club	2	1
Harvard College	39	47
Harvard College Herbarium	2	1
Harvard College Observatory	22	34
Museum of Comparative Zoology	80	88
Nuttall Ornithological Club	.....	1
Peabody Museum of American Archæology	4	.....
Jamaica Plains:		
Bussey Institute	5	12
Leicester:		
Leicester Public Library	.....	2
Newton Centre:		
Theological Institution	5	.....
Pennikese Island:		
Anderson School of Natural History	.....	4
Salem:		
American Association for the Advancement of Science	43	47
American Naturalist	13	17
Essex Institute	76	81
Peabody Academy of Sciences	76	89
North Church and Society	.....	1
Taunton:		
State Lunatic Asylum	1	.....
Wellesley:		
Wellesley College	7	.....
Williamstown:		
Williams College	4	.....
Worcester:		
American Antiquarian Society	19	11
MICHIGAN.		
Ann Arbor:		
Herbarium of the University of Michigan	1	.....
Observatory	9	10
University of Michigan	7	.....
Coldwater:		
Michigan Library Association	.....	9
Detroit:		
Michigan State Agricultural Society	12	5
Kalamazoo:		
Asylum for Insane	1	.....
Lansing:		
Michigan State Board of Health	3	.....
MINNESOTA.		
Duluth:		
Scandinavian City Library	1	.....
Minneapolis:		
Minnesota Academy of Natural Sciences	8	8
University of Minnesota	.....	1
Saint Peter:		
Hospital for the Insane	1	.....
Saint Paul:		
Minnesota Historical Society	10	6
MISSISSIPPI.		
Oxford:		
University of Mississippi	.....	2
MISSOURI.		
Columbia:		
University of Missouri	6	.....
Fulton:		
State Lunatic Asylum	1	.....
Glasgow:		
Morrison Observatory	.....	1
Saint Louis:		
Geological Survey of Missouri	4	6
MISSOURI—Continued.		
Mayor of the city of Saint Louis	2	1
Public Library	1	1
Saint Louis Academy of Science	100	117
Saint Louis University	2	1
State Board of Agriculture	1	2
Washington University	3	.....
NEBRASKA.		
Lincoln:		
University of Nebraska	1	.....
NEW HAMPSHIRE.		
Concord:		
Department of Agriculture	2	.....
New Hampshire Historical Society	4	3
State Agricultural Society	4	.....
State Lunatic Asylum	1	.....
Hanover:		
Dartmouth College	7	6
NEW JERSEY.		
Hoboken:		
Stevens Institute of Technology	7	9
Newark:		
New Jersey Historical Society	7	.....
New Brunswick:		
Geological Survey of New Jersey	5	6
Natural History Society	1	.....
Princeton:		
College of New Jersey	21	23
Observatory of College of New Jersey	.....	1
Trenton:		
State Lunatic Asylum	1	.....
NEW YORK.		
Albany:		
Adirondack Survey Office	4	3
Albany Institute	15	15
Dudley Observatory	16	26
New York State Agricultural Society	15	19
New York State Library	50	60
New York Medical Society	2	1
New York State Museum of Natural History	4	7
New York State University	5	6
Blackwell's Island:		
New York City Lunatic Asylum	1	.....
Brooklyn:		
Long Island Historical Society	1	2
Mayor of the city of Brooklyn	1	.....
Buffalo:		
Buffalo Historical Society	1	1
Buffalo Medical Association	1	.....
Buffalo Society of Natural Sciences	55	73
Observatory	1	.....
Clinton:		
Hamilton College	1	.....
Litchfield Observatory	4	12
Cornwall:		
Cornwall Library	.....	1
Geneva:		
Hobart College	.....	2
Hamilton:		
Madison University	1	.....
Ithaca:		
Cornell College	5	6
New York:		
American Chemical Society	.....	3
American Chemist	3	3
American Christian Commission	4	.....
American Ethnological Society	.....	1
American Geographical Society	63	60
American Institute	11	15
American Institute of Architects	13	7
American Library Journal	1	.....
American Microscopical Society	1	1
American Museum of Natural History	12	14
American Numismatic and Archæological Society	2	.....

Packages received by the Smithsonian Institution, &c.—Continued.

	1877.	1878.
NEW YORK—Continued.		
American Public Health Association	2	2
American Society of Civil Engineers	14	7
Anthropological Institute of New York	.....	6
Astor Library	18	18
Bloomingdale Asylum for the Insane	1	.....
Board of Health of the city of New York	2	.....
Columbia College	4	2
Commissioners of Central Park	1	.....
Engineering and Mining Journal	18	12
Insurance Department	2	.....
Manufacturer and Builder	13	7
Mayor of the city of New York	1	1
Medical Journal	1	.....
Medical Recorder	1	.....
Mercantile Library Association	4	2
Metropolitan Board of Health	1	.....
Metropolitan Museum of Art	1	1
New York Academy of Medicine	3	4
New York Academy of Sciences	81	100
New York Historical Society	1	6
New York Meteorological Observatory	.....	11
Observatory	1	.....
Sanitarian	14	10
School of Mines	15	16
Scientific American	2	1
Scottish American Journal	2	1
Swedenborg Society	1	.....
Swedish-Norwegian Consulate	2	.....
United States Sanitary Commission	6	5
University of the City of New York	12	6
Van Nostrand's Eclectic Engineering Magazine	2	1
Poughkeepsie:		
Vassar College	4	1
Rochester:		
Theological Seminary	.....	1
Schenectady:		
Union College	3	.....
Utica:		
State Lunatic Asylum	1	1
West Point:		
Observatory	1	.....
United States Military Academy	1	3
OHIO.		
Ashtabula:		
Anthropological Society	.....	1
State Archæological Society	1	.....
Athens:		
Ohio University	1	.....
Cincinnati:		
American Medical College	1	.....
Cincinnati Observatory	17	25
Cincinnati Quarterly Journal of Science	3	2
Historical and Philosophical Society	1	.....
Longview Asylum for the Insane	1	.....
Mayor of the city of Cincinnati	2	.....
Mercantile Library	.....	1
Natural History Society	2	2
Public Library	1	3
University of Cincinnati	3	3
Young Men's Mercantile Library	3	.....
Cleveland:		
Academy of Natural Sciences	1	.....
Columbus:		
Geological Survey of Ohio	5	7
Ohio State Board of Agriculture	18	57
Ohio State Library	9	9
Delaware:		
Museum of Wesleyan University	1	.....
Ohio Wesleyan University	1	.....
Gambier:		
Kenyon College	.....	1
North Bend:		
Ohio Horticultural Society	.....	8
Urbana:		
Urbana University	1	.....

	1877.	1878.
OHIO—Continued.		
Yellow Springs:		
Antioch College	3	.....
PENNSYLVANIA.		
Allegheny:		
Allegheny Observatory	8	4
Society of Natural Sciences	1	.....
Carlisle:		
Belles-Lettres Society	1	.....
Dickinson College	7	.....
Chester:		
Crozer Theological Seminary	.....	1
Easton:		
American Institute of Mining Engineers	11	11
Lafayette College	.....	2
Germantown:		
Germantown Library Association	2	1
Harrisburg:		
Medical Society of the State of Pennsylvania	2	.....
State Library	4	1
Philadelphia:		
Academy of Natural Sciences	146	200
American Entomological Society	21	22
American Journal of Conchology	3	4
American Pharmaceutical Association	31	28
American Philosophical Society	108	145
Board of Health	1	.....
Board of Public Education	3	4
Central High School	2	1
Commissioners of Fairmount Park	2	.....
Dental Cosmos	1	.....
Director of the Mint	.....	1
Franklin Institute	28	36
Friends' Book-Store	1	.....
Geological Survey of Pennsylvania	4	4
Girard College	.....	3
Historical Society of Pennsylvania	10	5
Institution for the Deaf and Dumb	.....	1
Jefferson Medical College	2	.....
Library Company	2	1
Mayor of the city of Philadelphia	2	1
Medical Times	14	10
Mexican Commission	2	.....
Observatory of Girard College	5	2
Office of Gray's Atlas	1	.....
Pennsylvania Hospital	1	1
Pennsylvania Hospital for the Insane	1	.....
Philadelphia Society for the Promotion of Agriculture	1	.....
Social Science Association	.....	1
Stacey Stone Dressing Machine Company	1	.....
University of Pennsylvania	2	4
Wagner Free Institute of Science	14	10
Zoological Society	5	18
Pittsburg:		
National Iron and Steel Publishing Company	3	.....
South Bethlehem:		
Lehigh University	2	3
RHODE ISLAND.		
Providence:		
Brown University	5	2
City Registrar's Office	.....	2
Rhode Island Historical Society	4	2
Rhode Island Society for the Encouragement of Domestic Industry	1	.....
SOUTH CAROLINA.		
Charleston:		
Charleston Library Society	3	1
Charleston Medical Journal and Review	1	.....
Charleston Museum of Natural History	.....	1

Packages received by the Smithsonian Institution, &c.—Continued.

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SOUTH CAROLINA—Continued.		
Charleston Observatory	1	.....
Elliott Society of Natural History	11	20
South Carolina Historical Society	2	.....
South Carolina Medical Association	3	.....
Columbia:		
University of South Carolina	3	1
Lexington:		
Theological Seminary of the Evangelical Lutheran Club	.....	1
TENNESSEE.		
Knoxville:		
East Tennessee University	2	.....
Philomathean Society	1	.....
Lebanon:		
Cumberland University	4	.....
Nashville:		
Hospital for the Insane	3	.....
Tennessee Historical Society	1	.....
University	5	.....
TEXAS.		
Austin:		
State Library	1	.....
University of Texas	.....	1
Chapel Hill:		
Soule University	4	2
VERMONT.		
Barnet:		
Vermont Historical and Antiquarian Society	1	.....
Brattleborough:		
Vermont Asylum for Insane	1	.....
Burlington:		
University of Vermont	6	2
Castleton:		
Orleans County Society of Natural Sciences	26	33
Montpelier:		
State Cabinet of Natural History	1	.....
State Library	5	3
VIRGINIA.		
Charlottesville:		
University of Virginia	14	3
Hampden Sidney:		
Hampden Sidney College	1	.....
Norfolk:		
Agricultural Society	1	.....
Richmond:		
Historical Society of Virginia	1	.....
Medical Society of Virginia	3	1
State Library	6	1
WISCONSIN.		
Appleton:		
Lawrence University	1	.....
Galesville:		
Galesville University	1	.....
Inmansville:		
Wisconsin Scandinavian Society	2	.....
Janesville:		
Wisconsin Institute for the Education of the Blind	.....	1
Madison:		
State Historical Society of Wisconsin	10	9
State Library	2	2
Superintendent of Public Instruction	1	.....
University of Wisconsin	3	2
Washburn Observatory	.....	1
Wisconsin Academy of Arts and Sciences	31	32
Wisconsin State Agricultural Society	19	19
Milwaukee:		
Milwaukee University	3	.....

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WISCONSIN—Continued.		
Natural History Society	3	9
Skandinaviske Presseforning	1	.....
Neenah:		
Scandinavian Library	3	.....
Oshkosh:		
Northern Hospital for the Insane	1	.....
BRITISH AMERICA.		
Fredericton, New Brunswick:		
University of New Brunswick	.....	1
Halifax, Nova Scotia:		
Nova Scotian Institute of Natural Sciences	9	3
Hamilton, Ontario:		
Scientific Association	.....	4
Kingston, Ontario:		
Botanical Society of Canada	1	.....
Observatory	.....	1
Queen's College	2	.....
Milltown, St. Stephen's, New Brunswick:		
Public Library	5	.....
Montreal, Quebec:		
Entomological Society	2	.....
Geological Survey of Canada	10	13
Mayor of the city of Montreal	.....	1
McGill College	4	.....
Mechanics' Institute	1	.....
Montreal Observatory	.....	1
Natural History Society	19	25
Société d'Agriculture du Bas-Canada	1	1
Ottawa, Ontario:		
Library of Parliament	3	1
Literary and Scientific Society	.....	3
Quebec, Quebec:		
Geographical Society	.....	1
Laval University	4	1
Le Naturaliste Canadien	2	.....
Literary and Historical Society	13	2
Observatory	1	1
Superintendent de l'Instruction Publique	2	.....
St. John, New Brunswick:		
Natural History Society	.....	5
Toronto, Ontario:		
Board of Agriculture	2	.....
Canadian Institute	19	30
Literary and Historical Society	1	1
Meteorological Office	2	4
Museum of Education	3	.....
Observatory	4	6
School of Practical Science, of Agriculture and Arts	3	.....
University of Toronto	6	6
INDIVIDUALS.		
Abbe, Prof. C	4	9
Adams, Prof. H	.....	1
Agassiz, Prof. A	11	21
Aikens, M. L. A	.....	1
Alexander, Prof. S	1	1
Allen, J. A	2	3
Allen, H	.....	2
Alvord, General	1	.....
Ames, Mrs. M. P	2	.....
Anderson, R. B	1	.....
Andrews, W. V	.....	1
Angell, J. B	.....	1
Anthony, J. G	1	2
Appleton, N	.....	1
Arch, Col. M	1	.....
Armstrong, Doctor	.....	1
Ashe, Commander E	.....	1
Ashley, A	1	.....
Astor, W. B	.....	1
Atkinson, C	.....	1
Atkinson, E	1	.....
Atwood & Culver, Messrs	1	.....

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INDIVIDUALS—Continued.		
Austin, Mrs. R. M	1	.....
Austin, C. F	....	1
Baird, Prof. S. F	53	59
Bailey, H. B	1	.....
Baker, Prof. W. S	1	.....
Ballard, J	.....	1
Bancroft, Hon. G	4	2
Bancroft, H. H	1	.....
Bannister, H. M	1	1
Barber, E. A	.....	2
Barker, Prof. G. F	.....	1
Barlois, Hon. F. C	.....	1
Barnard, Prof. F. A. P	1	2
Barnard, J. M	....	1
Barnes, Hon. W	4	6
Barnes, Surgeon-General	.....	1
Barrett, G. H. M	...	1
Bartlett, Prof. W. H. C	1	.....
Bassett, H. T	1	.....
Bascomb, Prof. J	1	.....
Baxter, Dr. J. W	1	.....
Bean, Dr. T. H	...	1
Bebb, M. S	5	.....
Bell, R	1	.....
Bennet, J. G	.....	1
Berckmans, J. J	1	1
Berton, ——	.....	1
Bessels, Dr. E	10	23
Bessey, Prof. C. E	1	.....
Bethune, Rev. C. J. S	2	.....
Bigelow, F. H	.....	1
Billings, E	.....	1
Binney, W. G	5	7
Blake, Prof. W. P	4	3
Bland, T	.....	3
Blazius, Professor	.....	1
Blodget, L	1	.....
Boardman, G. A	1	.....
Boehmer, G. H	1	6
Bolander, Doctor	.....	1
Bors, Consul C	1	.....
Bowditch, Dr. H	3	.....
Bowditch, H. T	.....	1
Bowles, G. J	.....	1
Bradbrook, S. G	2	1
Bradley, F. A	.....	1
Bradley, Judge	1	.....
Bradley, F. H	.....	1
Brady, S	.....	1
Brendel, Dr. F	1	3
Brevoort, J. C	2	.....
Brewer, Dr. T. M	5	2
Broadhead, G. C	1	1
Brocklesby, Professor	.....	1
Brooks, Maj. T. B	1	.....
Brown, S	1	.....
Brown, S. G	.....	1
Brunet, L'Abbé O	1	.....
Brush, Prof. J. G	5	1
Buchanan, Doctor	.....	1
Buchanan, Dr. A	2	.....
Bullard, J	1	.....
Burgens, E	.....	1
Burnham, S. W	2	1
Butler, J. D	.....	1
Butler, G. D	2	.....
Canby, W. M	1	.....
Capron, General H	2	.....
Carpenter, Prof. S	1	.....
Carey, H. C	1	.....
Case, L	.....	1
Chalmers, R	.....	1
Chamberlain, J. C	.....	2
Chandler, jr., S. C	.....	1
Chandler, Prof. C. F	5	.....
Chandler, Prof. W. H	1	.....
Charlier, E	1	.....
Chase, Prof. P. E	1	1
Chauveau, Hon. J. P. O	3	.....
Cherry, C	.....	1
Claghorn, J. L	1	.....
Clarke, Prof. F. W	.....	3
Clark, S. F	1	.....
Claypole, E. W	1	.....
Cleveland, D	1	.....
Clinton, W. G	1	1
Coffin, J. H. C	1	.....
Coffin, S. J	1	1
Cohn, Professor	1	.....
Comstock, General	1	.....
Congdon, T. W	1	.....
Conklin, A	1	.....
Conrad, Doctor	1	.....
Cook, G. H	1	1
Cook, J. P	1	.....
Cook, jr., J. P	.....	1
Cope, E. D	7	12
Coues, Dr. E	8	11
Cox, E. T	12	7
Craftes, Prof. J. M	1	.....
Cresson, E. T	.....	2
Cushing, F. H	.....	1
Cutting, H. B	.....	1
Dabney, Rev. Professor	.....	1
Dale, Prof. T. N	.....	2
Dall, W. H	31	28
Dalton, Dr. J. C	1	.....
Dana, E. S	2	.....
Dana, Prof. J. D	32	40
Dana, jr., Rev. R. H	.....	1
Davidson, Prof. G	3	3
Davis, Rear-Admiral C. H	1	1
Davis, H. E	1	1
Davison, E. F	.....	1
Dawson, Dr. J. W	3	3
Deane, Dr. C	.....	1
Dejardin, P	.....	1
Dike, C	1	1
Dobson, James	1	1
Dobson, John	1	1
Dow, Capt. J. M	4	5
Downes, J	1	.....
Draper, Dr. D	3	1
Draper, Dr. H	1	2
Draper, Prof. J. W	1	.....
Draper, L. C	.....	1
Ducatel, Madam	1	.....
Eads, J. B	1	.....
Eastman, Prof. J. R	2	1
Eaton, Hon. J	.....	1
Eaton, William S	.....	1
Edwards, H	.....	1
Edwards, W	.....	3
Egleston, Prof. T	5	1
Eisen, Dr. G	.....	2
Elder, Dr. W	1	.....
Eliot, Prof. C. W	1	.....
Eliot, S	.....	1
Ellinwood, Dr. E. M	.....	1
Elliot, Doctor	1	.....
Ellis, J. B	1	.....
Ellis, F. B	.....	1
Ellis, Rev. G. E	.....	1
Emerson, Prof. B	6	5
Emmons, Judge	.....	1
Endlich, Dr. F. M	2	.....
Engelmann, Dr. G	2	1
Ericson, Capt. J	2	.....
Exall, H	....	1
Farlow, Dr. W. G	2	3
Farquarson, R. J	.....	1
Farskey, Colonel	1	.....
Fay, S	1	1
Ferrell, Prof. W	.....	2
Fields, D. D	.....	1
Firth, A	2	2
Fish, Hon. H	.....	1
Fisher, Dr. G. J	4	2

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INDIVIDUALS—Continued.		
Fiske, W	1	.....
Fiss, G. W	1	1
Fitch, A	.....	1
Fitch, G. T	1	.....
Fleischer, F	1	.....
Flügel, W	.....	1
Force, W. Q	1	.....
Ford, S. W	1	3
Foreman, Dr. E	1	1
Fowler, W. C	1	.....
Fremont, General J	.....	16
Fuller, H. W	.....	1
Gabb, Dr. W. M	1	1
Gatschet, N. S	1	1
Genth, Dr. F. A	3	.....
Gibbs, W	1	1
Gilbert, G. K	3	2
Gill, Prof. T	5	5
Gilman, Prof. D. G	.....	1
Gilpin, Governor W	.....	1
Goodall, A. G	.....	1
Goode, G. B	.....	2
Goodfellow, E	1	.....
Goshorn, A. T	1	.....
Grant, Maj. C. C	.....	1
Gray, Prof. A	20	17
Greene, Rev. E. L	2	.....
Gregory, J. M	.....	1
Grote, A. R	.....	1
Gurman, Dr.	1	.....
Guttenberg, G	1	.....
Guyot, Prof. A	10	8
Habel, Doctor	.....	1
Hagen, Dr. H. A	2	5
Haldeman, S. S	1	1
Hall, Prof. A	.....	2
Hall, Prof. J	6	16
Hammond, Dr. W. A	.....	2
Hanson, P	.....	1
Harding, C. L	1	1
Harding, E	1	1
Harding, G. W	1	1
Hare, Prof. H. B	1	.....
Harkness, Prof. W	1	3
Harper & Brothers	1	.....
Harrington, Prof. M. W	1	.....
Hartranft, Hon. J. F	1	.....
Hawley, General J. B	1	.....
Hayden, Dr. F. V	116	125
Hayes, Dr. J. J	1	.....
Heinzer, C	1	.....
Henry, Prof. J	32	11
Heizer, J. M	1	.....
Herbert, G	1	.....
Higgins, E. S	1	1
Hilgard, E. W	1	.....
Hilgard, Prof. J. E	1	1
Hill, G. W	1	1
Himrichs, Prof. G	8	18
Hilton, W	.....	1
Hitchcock, Prof, C. H	1	.....
Hitchcock, Prof. R. D	.....	1
Hitz, J	.....	1
Holden, Prof. E. S	3	4
Holden, W	.....	1
Holley, A	1	.....
Holmes, W. H	2	.....
Holmes, D. S	.....	1
Holmes, N	.....	1
Horn, Dr. G. H	.....	1
Horsford, Prof. E. N	2	.....
Hough, F. B	8	4
Hovey, Prof. A	1	.....
Howe, E C	.....	1
Howells, W. D	2	.....
Hoyt, J. W	.....	1
Humphreys, General A. A	1	2
Hun, T	.....	1
Hunnies, A	.....	1
Hunt, Prof. T. S	2	1
INDIVIDUALS—Continued.		
Hyatt, Prof. A	4	5
Isaacs, S. E. U	.....	1
Jackson, W. H	2	.....
Jagger, Bishop	.....	1
Jarvis, Dr. E	34	21
Jewett, Col. E	1	.....
Johnson, J. A	1	.....
Johnson, O. C	1	.....
Johnson, S. W	1	.....
Jones, C. C	.....	1
Jones, M. E	1	1
Joly, H. G	1	.....
Joor, Dr. J. F	.....	2
Joplin	5	.....
Joy, Prof. C. N	.....	1
Joyce, Dr. R	.....	1
Kaiser, Dr. P. D	1	.....
Kendall, Prof. O	.....	1
Kennedy, J. C. G	.....	1
Kerr, W. C	1	.....
Keyes, E. W	1	.....
King, C	6	9
Kingsley, T. S	.....	1
Kingsley, W. L	.....	1
Kingston, Prof. G. T	.....	2
Kirtland, Dr. J. P	1	.....
Knight, E	1	.....
König, Doctor	.....	1
Könings, Rev. A	.....	1
Kolkin, Mr	1	.....
Koren, Rev. V	1	.....
Lamphere, A. T	.....	1
Landreth & Sons	1	.....
Lane, G. M	.....	1
Langley, Prof. J. P	.....	1
Lanman, C. R	3	.....
Lapham, Dr. S. G	1	.....
Lawrence, G. N	.....	5
Lawrence, Hon. W. B	.....	1
Lea, Dr. I	14	19
Lea, C	1	.....
LeClair, T. S	1	.....
LeConte, Dr. J	4	9
LeConte, Prof. Joseph	1	1
Lee, Admiral S. P	.....	2
Lee, Col. F. L	2	.....
Lees, J. S	1	.....
Leidy, Prof. J	8	20
Lemmon, J. G	1	.....
Leonard, Prof. T. M	.....	3
Lesley, Prof. J. P	2	5
Lesquereux, Prof. L	2	4
Leyman, T	1	.....
Lindermann, H. R	1	.....
Longfellow, H	.....	3
Longfellow, F. W	2	.....
Longstreth, F. W	1	.....
Loomis, Prof. E	7	14
Lovering, Prof. J	3	2
Lyman, Dr. B. T	2	.....
Lyman, Prof. C. S	.....	2
Lyman, T	.....	5
McCagg, E. B	.....	1
Macoun, Prof. J	.....	2
Magelsen, Rev. C	1	.....
Mallet, J. W	1	.....
Manigault, G. E	6	5
Marcy, Dr. O	.....	1
Marsh, Prof. F. A	1	.....
Marsh, Prof. O. C	9	14
Mason, Prof. O. T	1	.....
Master, A	.....	1
Matile, G. A	.....	1
Matthews, G. F	2	1
Mayes, Prof. A. M	.....	1
Mechan, J. H. M	1	.....
Mechan, Dr. T	1	.....
Meigs, Dr. J. A	4	5
Merriam, G. & C	1	.....
Merriman, Dr. M	.....	1

Packages received by the Smithsonian Institution, &c.—Continued.

	1877.	1878.
INDIVIDUALS—Continued.		
Meyer, J. E	.....	2
Michelet, N	1	.....
Miller, S. A	.....	3
Milner, Mr	.....	1
Minot, Professor	.....	1
Mitchel, J. E	1	.....
Mitchell, H	.....	1
Mitchell, Dr. S. Weir	1	.....
Morgan, Dr. L	1	.....
Morman, A. T	.....	1
Morris, Prof. G. S	1	.....
Morris, Dr. J. G	.....	1
Morse, Dr. E. S	3	.....
Morton, Dr. H. H	1	1
Motley, J. L	.....	2
Munroe, F. H	1	.....
Muns, Rev. B. J	1	.....
Myer, Brig. Gen. A. J	1	4
Neumögen, B	1	2
Newberry, Dr. J. S	4	6
Newcomb, Prof. S	8	15
Newton, Prof. H. A	1	4
Newton, General J	1	.....
Nicholson, W. L	.....	1
Nichos, Prof. R	1	.....
Nipher, Prof. F. E	.....	1
Nivens, J. F	.....	1
Nolan, E. J	1	.....
Northrop, Hon. B. E	1	1
Norton, Prof. W. A	1	.....
Norton, Prof. C. E	.....	3
Nourse, Prof. J. E	2	2
Olds, L. P	1	.....
Oliver, Prof. J. E	1	.....
Olmstead, Rev. L	1	3
Olsen, A	1	.....
Ordway, Dr. A	.....	1
Osten-Sacken, Baron R	7	.....
Ottesen, Rev. J. A	1	.....
Outerbridge, A. A	1	.....
Paaren, Dr. A. H	2	5
Packard, Dr. A. S	8	.....
Packard, jr., Dr. A. S	.....	13
Paine, Dr. M	1	.....
Palpey, J. G	1	.....
Parker, Dr. P	4	.....
Parkman, F	1	2
Parsons, Prof. T	1	.....
Patterson, Capt. C. P	.....	1
Peale, Dr. A. C	2	.....
Peale, T. R	.....	1
Pearson, J	11	14
Peck, C. H	1	1
Peckham, Prof. S. F	4	.....
Peirce, Prof. B	1	6
Perkins, C. C	1	.....
Perry, Dr. A. W	1	.....
Peters, Dr. C. H. F	4	4
Pettersen, Dr. F. V	.....	1
Pettit, H	1	.....
Philbrick, J. D	.....	1
Pickard, J. L	.....	1
Pickering, Dr. C	2	.....
Pickering, Prof. E. C	1	1
Pierrepoint, W. C	.....	1
Pinkham, Prof. G. L	.....	1
Pitkin, Doctor	1	.....
Poesche, T	.....	3
Porse, B. P	.....	1
Porter, Prof. S. C	1	.....
Pourtales, L. F. de	2	5
Powalky, Dr. C	1	.....
Powell, Maj. J. W	11	3
Powers, H. A	.....	1
Prime, Dr. F	1	.....
Prime, T	2	1
Pringle, C. G	.....	1
Prout, Dr. H. A	.....	1
Pumpelly, Prof. R	.....	1
Putnam, F. W	1	3
Putnam, Doctor	1	.....
Quinby, Dr. W. F	.....	1
Quincy, Hon. J	.....	1
Randolph, B	1	.....
Rassmussen, Rev. P. A	1	.....
Rau, Dr. C	5	3
Redfield, Professor	1	1
Reed, E. W	.....	1
Reis, N. T	.....	1
Reverbon, J	.....	2
Reynolds, Miss M	.....	1
Rhees, William J	1	.....
Richardson, Dr. W. T	.....	1
Ridgway, R	4	.....
Riley, C. N	2	3
Roberts, G	1	1
Robinson, R. W	1	1
Rodgers, Rear-Admiral J	1	2
Rodgers, Prof. R. E	1	.....
Roessler, A. R	.....	3
Rogers, Prof. F	1	1
Rogers, Prof. W. B	2	1
Rood, Prof. D. N	1	.....
Rood, Prof. O. N	1	1
Rosengarten, J. G	.....	1
Ross, A. M	1	.....
Roy, Mrs. J	.....	2
Rust, F. N	.....	1
Rutherford, L. M	1	4
Safford, Prof. J	.....	1
Safford, Prof. T. H	1	4
Salisbury, Prof. E. E	2	1
Sanborn, F. B	.....	1
Sandford, J. E	1	3
Sands, Rear-Admiral B. F	.....	2
Sargent, C. S	.....	1
Saussure, W. de	.....	4
Sayre, Prof. L. A	1	.....
Schaff, P	.....	2
Schott, C. A	1	1
Schroeder, Mrs. E	.....	1
Schumacher, P	.....	1
Schurz, Hon. C	.....	1
Schuster, M	.....	1
Scott, Colonel	1	.....
Scudder, S. H	7	6
Sellers, W	1	.....
Selwyn, A. R. G	2	.....
Sequard, Dr. C. Brown	1	.....
Seyffarth, Dr. G	1	.....
Shaler, Prof. N. S	1	.....
Sheidy, L. P	1	.....
Shugley, J	1	.....
Sibley, J. L	.....	1
Silliman, Prof. B	11	11
Simon, Prof. W	1	.....
Slater, jr., H. N	1	1
Smith, A	1	.....
Smith, Alex	.....	1
Smith, B. S	2	.....
Smith, Prof. H. L	2	4
Smith, Prof. J. L	4	1
Smith, Prof. S. I	1	.....
Smith, Prof. S	.....	2
Smith, W. H	1	.....
Snow, Dr. E	4	10
Soldan, F. P	.....	1
Squier, E. G	1	.....
Stallo, Judge F	.....	1
Stanley, A. & F	.....	1
Stearns, R. E. C	1	1
Steel, T	.....	1
Steere, Prof. J. B	1	2
Sterling, C	.....	1
Stevenson, J. J	1	.....
Stewardson, T	.....	1
Stewart, E. F	1	.....
Stirling, C	1	.....

Packages received by the Smithsonian Institution, &c.—Continued.

	1877.	1878.
INDIVIDUALS—Continued.		
Stockwell, J. W	.....	1
Stone, Dr. O	.....	2
Stover, Prof. F	1	.....
Strecker, H	1	3
Suckow, B. N	1	.....
Swallow, Prof. G. C	.....	1
Sweet, E. G	.....	1
Taft, R. C	1	1
Taylor, Prof. W. B	1	1
Thomas, Prof. C	.....	2
Thomas, S. H	.....	1
Thomson, J. H	13	14
Thompson, Dr. J. H	2	.....
Todd, D. P	3	1
Toner, Dr. J. M	.....	3
Trowbridge, Prof. J. P	1	.....
Trowbridge, Prof. W. P	1	.....
Trumbull, Dr. J. H	1	.....
Tryon, G. W	.....	2
Tuckerman, Prof. E	11	12
Twing, Rev. Dr	1	.....
Twining, Prof. A. C	.....	3
Tyler, S	1	.....
Uhler, Prof. P. R	.....	1
Van der Weyde, Prof. P. H	1	.....
Van Name, Prof. A	1	.....
Vasey, Dr. G	.....	1
Verrill, Prof. E. A	5	.....
Wacksmuth, C	1	1
Waite, Judge	1	.....
Walcott, C. D	.....	1
Walker, Dr. D	1	.....
Walker, Prof. F. A	6	7
Walker, J	1	.....
Walton, J. J	1	.....
Ward, Prof. A. H	.....	1
Ware, Mrs. M. G	1	.....
Waring, Col. G. E	1	.....
Watson, Prof. J. C	1	2
Watson, Prof. S	1	.....
Weeden, W. B	1	1
Welling, Prof. J. C	1	.....
Wells, J	1	.....
Wells, W. H	.....	1
Welsch, J	1	.....
Werner, Prof. A	.....	1
Weston, H. C	1	1
Wheatley, Prof. C. M	.....	1
Wheeler, Lieut. G. M	6	11
Whetherby, Prof. A. G	1	.....
White, Dr. C. A	5	7
White, Dr. M. C	1	.....
Whiting, Commodore W. B	.....	1
Whitney, Prof. J. D	3	6
Whitney, Prof. W. D	10	15
Whittier, J. G	1	.....
Wibbe, Prof. H	.....	1
Wickham, W. H	.....	1
Wigglesworth, E	.....	1
Wilder, Prof. B. G	1	1
Willey, H	2	2
Willey, O. S	1	.....
Williamson, S	2	.....
Wilson, J. M	1	.....
Winchell, Prof. A	.....	3
Winchell, Prof. N. H	.....	1
Wines, Rev. D	.....	1
Wing, E	.....	1
Winslow, E	.....	1
Wood, W	.....	1
Wordrow, Rev. Professor	1	1
Woodward, Dr. J. J	.....	2
Woolsey, Prof. D	1	.....
Worthen, Prof. A. H	8	7
Wright, Prof. A. M	.....	1
Wright, Prof. A. W	.....	1
Wright, Prof. R	.....	3
Wurtz, H	1	.....
Wyman, M	.....	1
Yarnall, Prof. M	1	1
Yarrow, Dr. H. C	6	8
Young, Prof. C. A	2	5
Young, C. B	15	9
Zeledon, Prof. M	1	1

RECAPITULATION.

	1877.	1878.
Total addresses of institutions	392	292
Total addresses of individuals	374	370
Total	766	662
Total number of parcels to institutions	3,868	4,059
Total number of parcels to individuals	1,094	1,233
Total	4,962	5,292

AGENTS FOR TRANSMISSION AND DISTRIBUTION OF SMITHSONIAN EXCHANGES.

Countries.	Shipping agents.	Distributing agents.
Algeria	Compagnie Générale Transatlantique (L. de Bébian), New York.	Commission Française des Echanges Internationaux, Paris.
Argentine Republic	Ed. F. Davison, New York	Museo publico, Buenos Aires.
Australia. (See New South Wales, New Zealand, Queensland, South Australia, Tasmania, Victoria.)		
Austro-Hungary	North German Lloyd, New York and Baltimore.	Dr. Felix Flügel, Leipzig.
Belgium	White Cross Line of Antwerp (Funch, Edye & Co.), New York.	Commission Belge d'Echanges Internationaux, Brussels.
Bolivia	Joseph S. Spinney, New York	University, Chuquisaca.
Brazil	Charles Mackall, vice-consul, Baltimore, Merchants' Line of Steamers (B. R. Borland), New York.	Instituto Historico, Geografico y Ethnografico, Rio Janeiro.
Canada	New York, Alexandria, Washington, and Georgetown steamers.	Geological Survey of Canada, Montreal.
Cape Colonies	Baltimore and Ohio Railroad foreign freight department.	William Wesley, London.
Central America. (See Costa Rica, Guatemala.)		
Chile	H. R. Grace & Co., New York	Universidad, Santiago.
China	Baltimore and Ohio Railroad foreign freight department.	William Wesley, London.
Colombia, United States of.	Pacific Mail Steamship Company, New York.	Sociedad de Naturalistas, Bogota.
Costa Rica	Pacific Mail Steamship Company	University, San José.
Cuba	Havana and West Indian Express (Carrington & Co.), New York.	Prof. F. Poey, Havana.
Denmark	Hamburg-American Steam Packet Company (Kunhardt & Co.), New York.	Kongelige Danske Videnskabernes Selskab, Copenhagen.
Ecuador	A. Flores, New York	Observatorio del Colegio Nacional, Quito.
Egypt	S. L. Merchant & Co., New York	Institut Egyptien, Alexandria.
Finland	Abs, Wyburg, Wasa and Finland Steam Navigation Company, Hull.	
France	Compagnie Générale Transatlantique (L. de Bébian), New York. Boyd & Hincken, New York.	Commission Française des Echanges Internationaux, Paris.
Germany	North German Lloyd (Oelrichs & Co., New York; Schumacher & Co., Baltimore).	Dr. Felix Flügel, Leipzig.
Great Britain	Cunard Line (C. G. Francklyn), New York. Baltimore and Ohio Railroad foreign freight department.	William Wesley, London.
Greece	Consul D. W. Botassi. New York	
Guatemala	Pacific Mail Steamship Company, New York.	Sociedad Economica de Amigos del Pais, Guatemala.
Guiana, British		Queen's College, Georgetown.
Guiana, Dutch	Thomas F. Bixby & Co., Boston	Surinaamsche Koloniaale Bibliotheek, Paramaribo.
Hayti	Atlas Steamship Company (Pim, Forwood & Co.), New York.	Sécrétaire de l'Etat des Relations Extérieures, Port-au-Prince.
Holland. (See Netherlands)		
Iceland	Hamburg-American Steam Packet Company (Kunhardt & Co.), New York.	Kongelige Danske Videnskabernes Selskab, Copenhagen.
India		William Wesley, London.
Italy	Anchor Steamship Line (Henderson & Bro.), New York.	Ulrico Hoepli, Milano.
Jamaica		Royal Society of Arts, Kingston.
Japan	Pacific Mail Steamship Company, New York. Japanese consuls in New York and San Francisco.	Imperial University, Tokio.
Java		Genootschap van Kunsten en Wetenschappen, Batavia.
Liberia	American Colonization Society, Washington.	
Mauritius		William Wesley, London.
Mexico	Juan N Navarro, consul, New York	Museo Nacional, Mexico.
Netherlands	Netherland-American Steamship Navigation Company (H. Cazaux), New York.	Bureau Scientifique (Prof. von Baumhauer), Harlem. Fred. Muller, Amsterdam.
New South Wales	R. W. Cameron & Co., New York	Royal Society of New South Wales, Sydney.
New Zealand	R. W. Cameron & Co., New York	Parliamentary Library, Wellington.

AGENTS FOR TRANSMISSION, &C.—Continued.

Countries.	Shipping agents.	Distributing agents.
Norway	Hamburg-American Steam Packet Company (Kunhardt & Co.), New York.	Kongeligo Norske Frederiks Universitet, Christiania.
Peru	Joseph S. Spinner, New York	Biblioteca Nacional, Lima.
Philippine Islands	Spanish consul, San Francisco (offered).	Royal Economical Society, Manila.
Portugal	Consul Gustav Amsink, New York	Ecola Polytechnica, Lisbon.
Queensland	Hon. A. McAllister, Queensland department, London.	Government Meteorological Observatory, Brisbane.
Russia	Wm. Ropes & Co., New York	L. Watkins & Co., St. Petersburg.
Sandwich Islands	Consul Severance, San Francisco	Royal Hawaiian Agricultural Society, Honolulu.
South Australia	R. W. Cameron & Co., New York	Astronomical Observatory, Adelaide.
Spain	Spanish consul, New York	Real Academia de Ciencias, Madrid.
Sweden	Hamburg-American Steam Packet Company (Kunhardt & Co.), New York.	Kongliga Svenska Vetenskaps Akademien, Stockholm.
Switzerland	North German Lloyd (Schumacher & Co.), Baltimore. Consul von Heyman, Bremen.	Bundes Canzlei, Bern.
Syria	J. Chrysoveloni & Co., Liverpool	
Tasmania	Crown agents for the colonies, London.	Royal Society of Tasmania, Hobarton.
Trinidad		Scientific Association, Port of Spain.
Turkey	Turkish Minister, Washington	
Venezuela	C G. de Garmendia, New York	Soc. de Ciencias Fisicas y Naturales, Caracas.
Victoria	R. W. Cameron & Co., New York	Public Library, Melbourne.
West Indies	Thomas Dennison, New York (for Antigua). H. B. Bailey, New York. Wilson & Asmus (for Turks Islands). Thomas Bland, New York. See also Cuba, Jamaica, Hayti.	

ACTS AND RESOLUTIONS OF CONGRESS RELATIVE TO THE SMITHSONIAN INSTITUTION.

FORTY-FIFTH CONGRESS, SESSION II.

PUBLIC RESOLUTION—NO. 6.

JOINT RESOLUTION filling an existing vacancy in the Board of Regents of the Smithsonian Institution.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the existing vacancy in the Board of Regents of the Smithsonian Institution, of the class other than members of Congress, shall be filled by the appointment of NOAH PORTER, of Connecticut, in place of JAMES D. DANA, resigned.

Approved, January 26, 1878.

PUBLIC RESOLUTION—NO. 15.

JOINT RESOLUTION filling an existing vacancy in the Board of Regents of the Smithsonian Institution.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the existing vacancy in the Board of Regents of the Smithsonian Institution, of the class other than members of Congress, shall be filled by the appointment of WILLIAM T. SHERMAN, of the city of Washington, in place of GEORGE BANCROFT, of said city, resigned.

Approved, March 25, 1878.

FORTY-FIFTH CONGRESS, SESSION III.

CHAPTER 21.

AN ACT authorizing the Chancellor of the Smithsonian Institution to appoint an Acting Secretary in certain cases.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in the case of the death, resignation, sickness, or absence of the Secretary of the Smithsonian Institution, the Chancellor thereof shall be, and he is hereby, authorized to appoint some person as Acting Secretary, who for the time being shall be clothed with all the powers and duties which by law are devolved upon the Secretary, and he shall hold said position until an election of Secretary shall be duly made, or until the Secretary shall be restored to his health, or, if absent, shall return and enter upon the duties of his office.

Approved, January 24, 1879.

REPORT OF THE EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION FOR THE YEAR 1878.

The Executive Committee of the Board of Regents of the Smithsonian Institution respectfully submit the following report in relation to the funds of the Institution, the appropriations by Congress for the support of the National Museum, the receipts and expenditures for both the Institution and the Museum for the year 1878, and the estimates for the year 1879:

Statement of the condition of the funds at the beginning of the year 1879.

The amount originally received as the bequest of James Smithson, of England, deposited in the Treasury of the United States, in accordance with the act of Congress of August 10, 1846		$515,169 00
Residuary legacy of Smithson, received in 1865, deposited in the Treasury of the United States, in accordance with the act of Congress of February 8, 1867		26,210 63
Total bequest of Smithson		$541,379 63
Amount deposited in the Treasury of the United States as authorized by act of Congress, February 8, 1867, derived from savings of income and increase in value of investments		108,620 37
Amount of the bequest of James Hamilton, of Carlisle, Pa., February 24, 1874		1,000 00
Total permanent Smithson fund in the United States Treasury, bearing interest at 6 per cent., payable semi-annually in gold		$651,000 00
In addition to the above, there remains of the extra fund, from savings, &c., in Virginia bonds and certificates, viz:		
Consolidated bonds	$58,700 00	
Deferred certificates	29,375 07	
Fractional certificate	50 13	
Total	88,125 20	
Valued January, 1879, at		34,000 00
Also, the cash balance in the United States Treasury at the beginning of the year 1879		19,632 57
Total Smithson funds, January 8, 1879		$704,632 57

RECEIPTS IN 1878.

Interest on $650,000, for the year 1878, at 6 per cent., gold.		$39,000 00
Premium on gold interest, July 1, 1878, at ½ per cent.....		97 50
Interest on Virginia bonds:		
Sale of coupons by Riggs & Co., for January 1 and July 1, 1878, for $3,522 (December 9, 1878) at 78–79.....		2,776 34
Interest on Hamilton fund of $1,000 for the year 1878.....	$60 00	
Premium on gold, July 1, 1878, at ½ per cent..	15	
		60 15
Repayment by Library of Congress:		
For advances made for international exchanges in 1877.		1,781 00
Balance on hand at the beginning of 1878.....		25,083 90
Total receipts for the year 1878.....		$68,798 89

EXPENDITURES IN 1878.

Building, furniture, and fixtures.....	$4,712 72	
General expenses.....	18,136 42	
Publications, researches, and explorations.....	15,732 92	
International literary and scientific exchanges.	10,250 41	
Gallery of art.....	333 85	
		$49,166 32
Cash balance, January 7, 1879.....		$19,632 57

HAMILTON BEQUEST.

Received from James Hamilton, February 24, 1874, and deposited with the Smithson fund in the Treasury of the United States.....		$1,000 00
Interest received from February 24, 1874, to December 31, 1878.....		306 32
Appropriated in 1876 for exploration of cave near Carlisle, Pa.....	$159 00	
Appropriated in 1878 for exploration of steatite quarry in Virginia.....	156 32	
		306 32

Statement of expenditures in 1878, *in detail.*

BUILDING.

Repairs and improvements.....	$4,346 43	
Furniture and fixtures.....	366 29	
		$4,712 72

GENERAL EXPENSES.

Meetings of the Board	$399 25	
Lighting the building	260 80	
Heating the building	593 37	
Postage and telegraphing	395 54	
Stationery	797 96	
Incidentals (ice, hauling, insurance, &c.)	642 03	
Salaries (including allowance to family of Professor Henry, $2,812.50)	14,371 96	
Extra clerk hire and labor	200 00	
Books and periodicals	475 51	
		$18,136 42

PUBLICATIONS, RESEARCHES, ETC.

Smithsonian Contributions to Knowledge	$5,523 14	
Miscellaneous Collections	7,432 48	
Annual Report	942 20	
Researches	1,032 13	
Apparatus	121 56	
Laboratory	86 21	
Explorations	595 20	
		15,732 92
Literary and scientific exchanges		10,250 41
Gallery of art		333 85
		$49,166 32

A larger expenditure for repairs of the building than was anticipated was made necessary by a violent and destructive storm which visited Washington last summer by which the finials or caps on some of the towers, and several hundred slates from the roof, were blown off, the lightning-rods detached, and much other damage done to the exterior of the building. Some alterations in the interior of the east wing have been made also.

The expenses attending "international exchanges" have steadily increased, until they now absorb about one-fourth of the entire income of the Institution. It has, therefore, in accordance with authority given by the Board of Regents, been decided to make a charge of five cents a pound on all packages received or sent by the government departments, a measure rendered necessary on account of the great increase in bulk of the public documents sent by them.

REPAYMENTS.

The Institution has made temporary advances during the year for freight, &c., the repayment of which, with the amount received from

sales of the publications of the Institution, have been deducted from the expenditures for the year. These credits have been as follows:

Publications, sales	$261 83
Exchanges, repayments for freight	263 28
Books, repayment	30 00
Gallery of art, repayment	14 65
Postage, repayment	3 00
Incidentals, repayment	2 00
Total in 1878	$574 76

ESTIMATES.

The following are the estimates of receipts by the Institution for the year 1879, and the appropriations required for carrying on its operations during the same period:

Estimated receipts.

Interest on the permanent fund, receivable July 1, 1879, and January 1, 1880	$39,000 00
Interest on the Hamilton fund for 1879	60 00
Sale of Virginia coupons due January 1, 1879, and July 1, 1879	2,500 00
	41,560 00

Estimated appropriations.

For building	$2,000 00
For general expenses	14,000 00
For publications and researches	14,000 00
For exchanges	10,000 00
For books and apparatus	1,000 00
For contingencies	560 00
	41,560 00

The death of Professor Henry, the Secretary of the Institution, on the 13th of May, 1878, rendered necessary a special examination of the accounts up to that date by the Executive Committee, who found that, of the amount on hand at the beginning of the year 1878 ($25,083.90), there had been expended under his supervision and direction the sum of $16,560.92, every cent of which was accounted for by vouchers and entries in the usual books of account, with his characteristic precision and care. The balance ($8,522.98) was transferred, on the 28th of May, 1878, by the Treasurer of the United States, to the credit of the new Secretary of the Institution, Prof. Spencer F. Baird, in whose name the account of the Institution is now kept.

NATIONAL MUSEUM.

The following appropriations were made by Congress in 1878 for the "National Museum."*

"For preservation and care of the collections of the National Museum, including those from the International Exhibition of 1876," for the fiscal year ending June 30, 1879	$18,000 00
"For expenses of making up into sets, for distribution to institutions of learning and museums, the duplicate ores, minerals, and objects of natural history belonging to the United States," for the fiscal year ending June 30, 1879	5,000 00
	23,000 00
Armory Building.—"For expense of watching and storage of articles belonging to the United States, including those transferred from the International Exhibition of 1876," for the fiscal year ending June 30, 1879	2,500 00
	25,500 00

The following statement gives the receipts and expenditures of the National Museum during the year 1878:

RECEIPTS.

Balance of appropriation for "preservation of collections," January 1, 1878	$11,323 21	
Balance of appropriation for "Armory," January 1, 1878	1,488 25	
Balance of appropriation "National Museum" deficiency bill, January 1, 1878	2,040 90	
One half of the appropriation for "preservation of collections" and "distribution of duplicates," for year ending June 30, 1879	11,500 00	
One half of the appropriation for "Armory building," for year ending June 30, 1879	1,250 00	
Total receipts		$27,602 36

EXPENDITURES.

First quarter of 1878, January–March	Preservation	$6,338 55	
	Armory	897 24	
	Deficiency	1,914 18	
Second quarter of 1878, April–June	Preservation	4,984 66	
	Armory	591 01	
	Deficiency	126 72	

* Statutes of the United States, 1877–'78, page 233.

Third quarter of 1878, July–September	Preservation	$5,423 61	
	Armory	643 78	
Fourth quarter of 1878, October–December	Preservation	6,187 09	
	Armory	684 98	
Total expenditures			$27,781 82

The balance on hand for the purposes of the Museum for the remaining six months of the fiscal year ending 30th June, 1879, is $12,560.54; of which $11,389.30 belong to the "preservation" account, and $1,171.24 to the "Armory."

On the 27th of September, 1877, a commission was appointed by the President to examine the public buildings and report what additional means should be provided to secure them from destruction or injury by fire. This commission consisted of Col. Thomas L. Casey, United States Engineers, Commissioner of Public Buildings; Mr. Clark, Architect of the Capitol, and Mr. Hill, Architect of the Treasury. This Commission visited and inspected the Smithsonian Institution, and made the following report in regard to it, which was submitted to Congress on the 10th of December, 1877:*

"SMITHSONIAN INSTITUTION.—All the combustible materials used in the construction of the museum portion of the building should be removed and the parts renewed of fire-proof construction, and the openings connected with other parts of the building should be supplied with fire-proof doors."

An estimate has been submitted to Congress by the Hon. Secretary of the Interior for an appropriation of $3,000 to provide additional security against fire in the Smithsonian building for the government collections, in accordance with the foregoing report.

All payments on account of the "National Museum" are made by the disbursing-officer of the Department of the Interior on the presentation of the usual vouchers, approved by the Secretary of the Smithsonian Institution.

SUMMARY.

The Executive Committee have examined 755 vouchers for payments made from the Smithson income during the year 1878, and 578 vouchers for payments made from appropriations by Congress for the National Museum, making a total of 1,333 vouchers. All these vouchers bear the approval of the Secretary of the Institution, and a certificate that the materials and services charged were applied to the purposes of the Institution.

The committee have also examined the account books of the National Museum, and find the balance as before stated, viz, $12.560.54, to correspond with the certificates of the disbursing-officer of the Department of the Interior.

*Ex. Doc. No. 10, Forty-fifth Congress, Second session, House of Representatives.

The quarterly accounts-current, bank-book, check-book, and journal of the Institution have been examined and found to be correct, and show a balance to the credit of the Institution on the 8th of January, 1879, in the hands of the Treasurer of the United States, of $19,632.57, available for the current operations of the Institution.

Respectfully submitted.

PETER PARKER,
W. T. SHERMAN,
Executive Committee, Smithsonian Institution.

WASHINGTON, *January* 13, 1879.

JOURNAL OF PROCEEDINGS OF THE BOARD OF REGENTS.

WASHINGTON, D. C., *May* 13, 1878.

A meeting of the Board of Regents of the Smithsonian Institution was held this day at the Institution, at 8 o'clock p. m., under the following call:

SMITHSONIAN INSTITUTION,
May 13, 1878.

The Regents of the Smithsonian Institution are requested to meet at the Smithsonian building at 8 o'clock this Monday evening, to make suitable arrangements for the obsequies of Prof. Joseph Henry, whose decease occurred at 12.10 o'clock this afternoon.

By order of—

M. R. WAITE, *Chancellor.*

Present, the Chancellor—Chief Justice Waite, Hon. H. Hamlin, Hon. A. A. Sargent, Hon. R. E. Withers, Hon. H. Clymer, Hon. J. A. Garfield, Hon. Peter Parker, General W. T. Sherman.

The Chancellor made the following remarks:

MY BRETHREN OF THE BOARD OF REGENTS: I have asked you to come together this evening not to take action upon the great loss our Institution has sustained, but to consult as to what may best be done to pay honor to all that is mortal of the great and good man who, conceiving what Smithson willed, has devoted his life to making the bequest of our benefactor what he wished it to be, an instrument "for the increase and diffusion of knowledge among men."

The Chancellor stated that he understood that the family of Professor Henry had expressed the wish that the Board of Regents should make all the arrangements for the funeral.

Several of the Regents expressed their opinion that this was not the appropriate time to eulogize the deceased, as another and full meeting of the Board should be called for that purpose.

The following resolutions were adopted:

Resolved, That the Chancellor be directed to notify the President of the United States and his Cabinet, the Supreme Court of the United States, the Supreme Court of the District of Columbia, the two houses of Congress, the General of the Army, the Admiral of the Navy, the Diplomatic Corps, the Light-House Board, the National Academy of Sciences, the Washington Philosophical Society, and other organizations with

which he was connected, of the death of Prof. Joseph Henry, and to invite them to attend his funeral.

Resolved, That the funeral take place on Thursday, 16th May, at the New York Avenue Presbyterian Church, at 4.30 o'clock p. m.

Resolved, That the Regents meet at the Institution on Thursday next at 4 o'clock p. m. to attend the funeral in a body.

Resolved, That a committee, consisting of General Sherman, Hon. Peter Parker, and Prof. S. F. Baird, Assistant Secretary of the Institution, be appointed to make arrangements for the funeral ceremonies.

Resolved, That a meeting of the Board of Regents be held on Friday next, 17th May, at 10 o'clock, a. m. for the purpose of transacting such business as may come before it.

The Board then adjourned.

WASHINGTON, D. C., *May* 17, 1878.

A meeting of the Board of Regents of the Smithsonian Institution was held this day at 10 o'clock a. m.

Present, the Chancellor—Chief Justice Waite, Hon. H. Hamlin, Hon. A. A. Sargent, Hon. R. E. Withers, Hon. H. Clymer, Hon. J. A. Garfield, Rev. Dr. John Maclean, Hon. Peter Parker, Dr. Asa Gray, General W. T. Sherman, President Noah Porter.

General Garfield was requested to act as secretary.

At the request of the Chancellor, Rev. Dr. Maclean led in prayer for Divine guidance of the Regents in their present deliberations.

The following resolutions were then adopted:

1. *Resolved*, That the Regents of the Smithsonian Institution hereby express their profound sorrow at the death of Prof. Joseph Henry, late Secretary of this Institution, and tender to the family of the deceased their sympathy for their great and irreparable loss.

2. *Resolved*, That in consideration of the long-continued, faithful, and unselfish services of Joseph Henry, our late Secretary, there be paid to his widow the same sum to which he would have been entitled, as salary, for the remainder of this year, and that the Secretary be directed to make payment to her for the amount thereof monthly.

3. *Resolved*, That Mrs. Henry be informed of this action of the Board, and the desire of the Regents that she will continue the occupancy of the apartments now in her use for such period, during the remainder of this year, as may suit her convenience.

4. *Resolved*, That a committee be appointed who shall prepare and submit to this Board at its next annual meeting a sketch of the life, character, and public services of the late lamented Secretary, which shall be entered upon the records.

5. *Resolved*, That the Executive Committee of the Board be requested to make arrangements for a public commemoration in honor of the late Secretary of the Institution, of such a character and at such a time as they may determine.

The Chancellor appointed as the special committee under the fourth resolution, President Porter, Dr. Gray, and Dr. Maclean.

On motion, it was resolved to consider the subject of election to fill the vacancy in the office of Secretary of the Institution.

Dr. Parker urged the propriety of deferring the election of Secretary to a later meeting, as it might appear precipitate to elect now.

Senator Hamlin thought the Board ought to proceed at once to elect a Secretary. To delay would be to invite great contention for the office.

Senator Withers thought the discussion should be confined to the question of postponement.

Dr. Parker then moved that the appointment of a permanent Secretary be postponed until the next annual meeting in January, and suggested that the Assistant Secretary might be invested with power to perform all the functions of Secretary during the *interim*.

Dr. Maclean said that when President Burr, of Princeton, died, his successor, President Edwards, was elected the fourth day after. He thought prompt action the wisest, and advocated the election of Professor Baird.

Mr. Clymer read the statute, and insisted that the Board was legally bound to elect a Secretary. No funds could be drawn nor payments made by any other officer, and an *ad interim* appointment was not provided for by the law of organization.

General Garfield suggested to Dr. Parker that he withdraw his motion, and that the Board proceed to elect, so that action might be taken of an affirmative rather than of a negative character.

President Porter expressed the opinion that the Board could elect a Secretary *pro tempore*.

Dr. Parker then withdrew his motion; and the construction of the statute by Mr. Clymer was agreed to by the majority of the Board.

Mr. Clymer moved to proceed to the election of a Secretary; which was agreed to.

The Chancellor appointed Mr. Sargent and Mr. Clymer as tellers.

The vote was then taken by ballot, and the tellers reported that eleven ballots were cast, all of which were for Spencer Fullerton Baird.

Messrs. Sargent and Clymer were appointed a committee to wait upon Professor Baird and inform him of his election, and invite him to attend the meeting of the Board.

The committee discharged this duty; and at half past eleven o'clock a. m. introduced the Secretary-elect to the Regents.

The Chancellor then formally announced to Professor Baird his unanimous election as Secretary.

Professor Baird made a brief acknowledgment of the honor conferred upon him, and stated that he would endeavor to discharge his duties faithfully and in accordance with the views of his lamented predecesor.

On motion, it was

Resolved, That the Chancellor prepare a suitable notice of the death of Professor Henry, to be sent to foreign establishments in correspondence with the Institution, and also notifying them of the election of Professor Baird as Secretary.

The Chancellor stated that the resignation of Mr. Bancroft had occasioned a vacancy in the Executive Committee, and, on motion, it was

Resolved, That the vacancy in the Executive Committee be filled by the election of General Sherman.

The Board then adjourned *sine die*.

Agreeably to the resolution of the Board, the Chancellor of the Institution, on behalf of the Regents, prepared the following circulars, which were promptly distributed to the correspondents of the Institution in all parts of the world:

"SMITHSONIAN INSTITUTION,

"*Washington, D. C., May* 14, 1878.

"On behalf of the Regents of the Smithsonian Institution, it becomes my mournful duty to announce the death of the Secretary and Director of the Institution, Joseph Henry, LL. D., which occurred in this city on Monday, May 13, at 12.10 o'clock p. m.

"Professor Henry was born in Albany, in the State of New York, December 17, 1799. He became professor of mathematics in the Albany Academy in 1826; professor of natural philosophy in the College of New Jersey, at Princeton, in 1832, and was elected the first Secretary and Director of the Smithsonian Institution in 1846.

"He received the honorary degree of Doctor of Laws from Union College in 1829, and from Harvard University in 1851.

"He was president of the American Association for the Advancement of Science in 1849; was chosen president of the United States National Academy of Sciences in 1868; president of the Philosophical Society of Washington in 1871, and Chairman of the Light-House Board of the United States in the same year; the last three positions he continued to fill until his death.

"Professor Henry made contributions to science in electricity, electromagnetism, meteorology, capillarity, acoustics, and in other branches of physics; he published valuable memoirs in the transactions of various learned societies of which he was a member, and devoted thirty-two years of his life to making the Smithsonian Institution what its founder intended it to be, an efficient instrument for the "increase and diffuion of knowledge among men."

"M. R. WAITE,

"*Chancellor of the Smithsonian Institutin.*

"SMITHSONIAN INSTITUTION,
"*Washington, D. C., May* 17, 1878.

"At a special meeting of the Board of Regents of the Smithsonian Institution, held this day, Prof. Spencer Fullerton Baird, for many years the assistant secretary of the Institution, was duly elected as the Secretary of the Smithsonian Institution, to succeed the late Prof. Joseph Henry.

"M. R. WAITE,
"*Chancellor of the Smithsonian Institution.*"

WASHINGTON, D. C., *January* 15, 1879.

A meeting of the Board of Regents of the Smithsonian Institution was held this day in the Regents' room, at 10 o'clock a. m.

Present, the Chancellor—Chief Justice Waite; Hon. W. A. Wheeler, Vice-President of the United States, Hon. A. A. Sargent, Hon. R. E. Withers, Hon. J. A. Garfield, Hon. H. Clymer, Dr. J. Maclean, Dr. A. Gray, Dr. H. Coppée, Hon. Peter Parker, President Porter, General Sherman, and the Secretary, Professor Baird.

An excuse was received from Hon. H. Hamlin for non-attendance, his absence being occasioned by his appointment by the Senate on a special committee to accompany the remains to Texas of Hon. G. Schleicher, a deceased member of Congress.

The minutes of the last meeting were read and approved.

The following communication from Mrs. Henry was laid before the Board by the Chancellor:

Hon. M. R. WAITE,
Chief Justice of the United States,
Chancellor of the Smithsonian Institution:

MY DEAR SIR: In my great affliction it is consoling to receive from friends tributes of sympathy and testimonials of respect for my late husband. I feel very deeply the kind consideration of the Board of Regents in their official capacity. Permit me, through you, to express to them the heartfelt thanks of my children and myself for the liberality extended to us and the full appreciation of Mr. Henry's character and labors while connected with the Institution, and for the public testimonials of respect and honor to his memory.

With my best wishes for the continued prosperity of the Institution, believe me yours, respectfully,

H. A. HENRY.

WASHINGTON, *January* 15, 1879.

On motion of General Garfield, it was—

Resolved, That the letter of Mrs. Henry be placed in the files of the Institution, and entered in the journal of the Board.

The Secretary, Professor Baird, presented a statement of the financial condition of the Institution for the year 1878, which for convenience of reference he had printed.

Dr. Parker, in behalf of the Executive Committee, presented the annual report of receipts, expenditures, estimates, &c., which at his request was read by General Sherman.

On motion of Mr. Withers, the report was adopted.

Dr. Parker, in behalf of the Executive Committee, presented a report in relation to the duty imposed on them by the fifth resolution of the Board of Regents, adopted at the meeting of May 17, 1878, "to make arrangements for a public commemoration in honor of the late Secretary of the Institution." The committee had held numerous meetings, the minutes of which were read, and the arrangements had finally been made as follows:

The exercises will be held in the Hall of the House of Representatives on Thursday evening, 16th of January, 1879.

The Vice-President of the United States, supported by the Speaker of the House, will preside on this occasion, and the Senate and House will take part in the exercises.

1. Opening prayer by Rev. Dr. McCosh, President of Princeton College.
2. Address by Hon. H. Hamlin, of the United States Senate.
3. Address by Hon. R. E. Withers, of the United States Senate.
4. Address by Prof. Asa Gray, of Harvard University.
5. Address by Prof. W. B. Rogers, of Boston.
6. Address by Hon. Jas. A. Garfield, of the House of Representatives.
7. Address by Hon. S. S. Cox, of the House of Representatives.
8. Address by General W. T. Sherman.
9. Concluding prayer by Rev. Dr. Sunderland, Chaplain of the Senate.

By authority of the Speaker of the House, reserved seats will be provided on the floor of the House for the following bodies with which Professor Henry was associated:

1. The Regents of the Smithsonian Institution and the orators of the evening, who will meet in the room of the Speaker of the House.
2. The National Academy of Sciences.
3. The Washington Philosophical Society.
4. The Light-House Board, who will meet in the room of the Committee of Ways and Means.
5. The Alumni Association of Princeton College.
6. The Trustees of the Corcoran Gallery of Art.
7. The Washington Monument Association, who will meet in the room of the Committee on Appropriations.

On motion of Mr. Sargent, the action of the committee was approved.

On motion of General Garfield, it was—

Resolved, That the Board of Regents assemble on Thursday evening next at half past seven o'clock, in the Speaker's room at the Capitol, to proceed in a body to attend the exercises in the Hall of the House of Representatives in honor of the memory of Professor Henry.

On motion of General Garfield, it was—

Resolved, That the Chancellor be empowered to act for the Board of Regents in making the final arrangements for the memorial exercises.

President Porter, from the special committee appointed at the last meeting, under the fourth resolution adopted by the Board, "to prepare a sketch of the life, character, and public services of Professor Henry," made a report that Dr. Gray had been selected by the committee to prepare the eulogy on behalf of the Board of Regents, and that it would form part of the exercises at the public commemoration at the Capitol.

Dr. Gray remarked that he had only recently been informed of his appointment to perform the service required, but that he had prepared a paper, which he would now present to the Board.* He had been limited by the committee to thirty minutes, but had arranged with Professor Rogers so that both should only occupy an hour. He would, however, insert details and documents in notes which could be printed with the eulogy.

On motion of General Garfield, Dr. Gray was requested, as the representative of the Board of Regents, to make his address as full and complete as possible.

General Garfield called attention to the fact that the increased business of the Institution had made it necessary to take the rooms in the east wing, formerly occupied by Professor Henry as a residence, for offices, and that it was therefore proper that a suitable allowance be made to Professor Baird for house-rent. After some conversation on the subject, it was—

Resolved, That the Executive Committee consider the propriety of making an allowance to the Secretary for house-rent and report on the subject at the next meeting of the Board.

On motion of Dr. Gray, it was—

Resolved, That the Board adjourn to meet on Friday morning, 17th January, at half-past 9 o'clock, to hear the annual report of the Secretary and to transact any other business which may be necessary.

The Board then adjourned.

WASHINGTON, D. C., *January* 16, 1879.

A meeting of the Board of Regents was held this day at 7.30 o'clock, p. m., in the room of the Speaker of the House of Representatives, and at 8 o'clock the Regents proceeded in a body to the Hall of the House of Representatives, to attend the public exercises in honor of Prof. Joseph Henry, late Secretary of the Smithsonian Institution.

WASHINGTON, D. C., *January* 17, 1879.

A meeting of the Board of Regents was held this day in the Regent's room at 9.30 o'clock a. m.

Present, the Chancellor—Chief-Justice Waite, Hon. A. A. Sargent, Hon. R. E. Withers, Hon. James A. Garfield, Hon. Hiester Clymer,

* See Appendix to Journal of the Board.

Hon. Peter Parker, Rev. Dr. John Maclean, Prof. Asa Gray, Prof. Henry Coppée, President Noah Porter, General Sherman, and the Secretary, Professor Baird.

The minutes of the meeting of January 15 were read and approved.

The Chancellor laid before the Board several hundred letters received in reply to the circulars issued by the Institution, announcing the death of Professor Henry, and the election of his successor.

The subject of the publication of the eulogies on Professor Henry, together with an account of his scientific writings, &c., was discussed, and on motion of Dr. Maclean, it was—

Resolved, That a special committee of three be appointed, of which the Secretary of the Institution shall be one, to prepare a memorial of Professor Henry, to include in a separate volume of the Smithsonian series such biographies and notices of the late Secretary of the Institution as may be considered by them worthy of preservation and publication.

The Chancellor appointed Messrs. Gray, Parker, and Baird, as the committee.

The Chancellor then stated that any remarks the Regents desired to make in relation to Professor Henry were in order.

Dr. Parker addressed the Board as follows:

MR. CHANCELLOR AND FELLOW REGENTS: We are making history, and I wish to say a few words that shall remain upon its page, in memory of Joseph Henry, our beloved and lamented friend and Secretary, when we, like him, shall have passed from earth.

Many have already pronounced his eulogy and set forth his rare talents and influence upon the world, and I need not, and could not, were I to attempt it, add to your appreciation of Professor Henry, his life and character, as a friend, scientist, and Christian, the highest type of man.

For twenty years I have been intimately acquainted with Professor Henry, and happily associated with him in many ways; for ten years as a Regent of the Smithsonian Institution, and as a member of the Executive Committee all that period our intercourse has been frequent and intimate. *I have never known a more excellent man.*

His memory has been much on my mind since he left us, and I often find myself inquiring how he and others like him are occupied now. His connection with time is severed, but his existence continues. When I recall the names of Professors Franklin Bache, Charles G. Page, Louis Agassiz, *Joseph Henry*, and others of similar intellect and virtue, I find myself asking the question, Are to them all consciousness and thought suspended by separation from the body? I am reluctant to come to such conclusion. But this I know, *the Infinite Father's ways are right.*

It seems most providential that Professor Henry had the opportunity

and the strength to give in person his last words, a priceless legacy, to the National Academy at its annual meeting in Washington, in April, and through that association to the civilized and scientific world; I refer to his sentiment "*that moral excellence is the highest dignity of man.*"

The loftiest talents and highest attainments without this are deficient in that, which, in the judgment of wise men and of Infinite Wisdom, is of greatest worth. Was there ever a man from whom the sentiment could come with better grace?

The opinion has been expressed, and I do not regard it extravagant, that the letter addressed by Professor Henry to his friend Joseph Patterson, emanating from such a mind, *such a man*, at the close of a protracted life of singular distinction, was worth a lifetime to produce. It has probably been read by millions, in various languages, and will be by future generations.

Professor Henry was not only a man of science, a discoverer of nature's laws and forces, but a sincere believer in God their Author and in his atoning Son. To quote his language: "We are conscious of having evil thoughts and tendencies that we cannot associate ourselves with a Divine Being, who is the Director and Governor of all, or even call upon him for mercy, without the intercession of one who may affiliate himself with us."

Let me quote from the prayer offered at his obsequies and to which we repeat our sincere *Amen;* the lips that uttered it, in less than one short month were silent in death, and the two remarkable men, Professors Joseph Henry and Charles Hodge, closely united in life were not long divided by death:

"We thank Thee, O God, that Joseph Henry was born; that Thou didst endow him with such rare gifts, intellectual, moral, and spiritual; that Thou didst spare him to a good old age, and enable him to accomplish so much for the increase of human knowledge and for the good of his fellow-men; and above all that Thou didst hold him up before this whole nation as such a conspicuous illustration of the truth that moral excellence is the highest dignity of man."

On motion of Dr. Maclean, it was—

Resolved, That the thanks of the Board of Regents be presented to the gentlemen who took part in the memorial services held in the United States Capitol on the 16th of January in honor of the late Professor Henry, and that they be requested to furnish copies of their remarks on that occasion.

Dr. Maclean stated that he intended in the above resolution to include General Sherman, who was prevented by the lateness of the hour from delivering the whole address he had prepared, Rev. Drs. McCosh and Sunderland, who offered prayers, and Mr. Clymer, who made a few introductory remarks of an exceedingly interesting character in presenting telegrams which had been sent to the meeting from London.

General Sherman, from the Executive Committee, presented a report on the subject of an allowance for house-rent to the Secretary, with the following preamble and resolution:

Whereas the east wing of the Smithsonian building, heretofore used as a residence by Professor Henry, is required for the purposes of the Institution; and whereas the present Secretary owns and occupies a separate residence in the city of Washington, for which it is but just and proper that he should be allowed compensation: Therefore,

Resolved, That the Secretary of the Smithsonian Institution, Prof. S. F. Baird, be allowed the sum of one hundred dollars per month for rent, fuel, gas, &c., from the date of his election as Secretary, May 17, 1878, to the 31st of December, 1879.

The Secretary presented his annual report, which was read, and it was

Resolved, That the annual report of the Secretary be approved and transmitted to Congress.

Dr. Parker suggested that there was a matter of some importance which ought to receive attention at this meeting. The Senate had passed on the 9th of January the following bill

For the erection of a fire-proof building for the National Museum.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That for a fire-proof building for the use of a National Museum, three hundred feet square, to be erected under the direction and supervision of the Regents of the Smithsonian Institution, in accordance with the plans now on file with the Joint Committee of Public Buildings and Grounds, on the southeast corner of the grounds of the Smithsonian Institution, the sum of two hundred and fifty thousand dollars is hereby appropriated out of any money in the Treasury not otherwise appropriated; said building to be placed east of the Smithsonian Institution, leaving a roadway between it and the latter of not less than fifty feet, with its north front on a line with the south face of the buildings of the Agricultural Department and of the Smithsonian Institution; and all expenditures for the purposes herein mentioned, not including anything for architectural plans, shall be audited by the proper officers of the Treasury Department."

If this should pass the House and become a law it would be necessary for the Board of Regents to take action in regard to the new building.

On motion of Mr. Clymer, it was

Resolved, That the Executive Committee of this Board, and the Secretary, or a majority thereof, be, and they are hereby, authorized and empowered to act for and in the name of the Board of Regents in carrying into effect the provisions of any act of Congress which may be passed providing for the erection of a building for the National Museum.

The Board then adjourned *sine die*.

BIOGRAPHICAL MEMOIR OF JOSEPH HENRY,

PREPARED IN BEHALF OF THE BOARD OF REGENTS,

BY

PROF. ASA GRAY.

The Regents of the Smithsonian Institution, on the day following the obsequies of their late Secretary, resolved to place upon record, by the hands of their committee, a memorial of their lamented associate. The time has arrived when this should be done, now that the Institution enters upon another official year, and its bereavement is brought freshly to mind.

Although time may have assuaged our sorrow, as time will do, and although the recollection that a well-spent life was well appreciated and not prematurely closed should temper regret, yet they have not dulled our sense of loss, nor lessened our estimate of the signal services to science, to this Institution, and to the general good which remarkable gifts and a devoted spirit enabled this man to render.

If we would fit this memorial to the subject of it, we must keep in mind Professor HENRY'S complete and transparent, but dignified simplicity and modesty of character, in which a delicate sense of justice went along with extreme dislike of exaggeration, and aversion to all that savored of laudation.

Yet it is not for ourselves, his associates—some of few, some of many years—that this record is made; nor need we speak for that larger circle of his associates, the men of science in our land, who will, in their several organizations, recount the scientific achievements of their late leader and Nestor. And nothing that we can say will enhance the sentiments of respect, veneration, and trust with which he was regarded here, in Washington, by all who knew him, whether of high or humble station. Even those, here or elsewhere, who came only into occasional intercourse with him, will remember that thoughtful and benignant face;—certainly it will be remembered by those who, in that recourse to him which it was always easy to gain, have seen the mild seriousness of a somewhat abstracted and grave mien change into a winning smile, sure precursor

of pleasant words, cheerful attention, and, if need were, wise counsel and cordial help. But we are all passing, as he has passed, and the tribute to his memory which it is our privilege to pay, is a duty to those who are to come after us.

JOSEPH HENRY was of Scotch descent. His grandparents, paternal and maternal, landed at New York from the same vessel on the day before the battle of Bunker Hill. The Henrys settled in Delaware County, the Alexanders in Saratoga County, New York. Of his father, William Henry, little is known. He died when his oldest son, Joseph, was eight or nine years old. His mother lived to a good age.* He was born at Albany very near the close of the last century.† His boyhood was mostly passed with his maternal grandmother in the country at Galway. His early education was such as a country common school would furnish to a lad of inquisitive mind but no aptness for study. The fondness for reading came early, but in a surreptitious way.

One day, in the pursuit of a pet rabbit, he penetrated through an opening in the foundation-wall of the village meeting-house. A glimmer of light enticed him through the broken floor into a room above, in which an open bookcase contained the village library. He took down a book—Brooks's Fool of Quality—was soon absorbed in the perusal, returned again and again to this, which he said was the first book he ever opened voluntarily, and to all the works of fiction which the library contained. Access in the regular way was soon granted to him.

The lad at this time was a clerk, or office-boy, in the store of a Mr. Broderick. He returned to Albany at the age of fourteen or fifteen. We may count it as a part of his education that he there served a brief apprenticeship to a silversmith, in which he acquired the manual dexterity afterward so useful to him. Opportunely perhaps, the silversmith soon failed in business, and young HENRY was thrown out of employment. His powers were now developing, but not in the line they were soon to take. To romance reading was now joined a fondness for the theater. Not content with seeing all the plays he could, he found his way behind the scenes, and learned the methods of producing stage

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* She is remembered as a lady of winning refinement of mien and character, of small size, with delicate Grecian features, fair complexion, and when young she is said to have been very beautiful.

† The date, December 17, 1797, given in the American Cyclopedias, appears to be wrong; was perhaps misprinted. There is little doubt that he was born on the 17th of December, 1799.

effects. He joined a juvenile forensic and theatrical society, called the Rostrum, and soon distinguished himself in it by his ingenuity in stage arrangements. He was made president, and having nothing else to do at the time, he gave his whole attention to the Rostrum. He dramatized a tale, wrote a comedy, and took a part in its representation. Unusually comely in form and features, and of prepossessing address, our future philosopher was in a fair way to become an actor, perhaps a distinguished one.

But now a slight illness confined him for a few days to his mother's house. To while away the hours he took up a small book which a Scotchman, who then occupied a room in the house, had left upon his mother's table. It was "Lectures on Experimental Philosophy, Astronomy, and Chemistry, intended chiefly for the use of young persons, by G. Gregory," an English clergyman. It is an unpretending volume, but a sensible one. It begins by asking three or four questions, such as these:

"You throw a stone, or shoot an arrow into the air; why does it not go forward in the line or direction that you give it? Why does it stop at a certain distance, and then return to you? * * * On the contrary, why does flame or smoke always mount upward, though no force is used to send them in that direction? And why should not the flame of a candle drop toward the floor when you reverse it, or hold it downward, instead of turning up and ascending into the air? * * * Again, you look into a clear well of water and see your own face and figure, as if painted there. Why is this? You are told that it is done by reflection of light. But what is reflection of light?"

Young HENRY'S mind was aroused by these apt questions, and allured by the explanations; he now took in a sense of what knowledge was. The door to knowledge opened to him, that door which it thence became the passion of his life to open wider. Thenceforth truth charmed him more than fiction. At the next meeting of his dramatic association he resigned the office of president and took his leave in a valedictory address, in which he assured his comrades that he should now prepare to play his part on another stage, with nobler and more impressive scenes. The volume itself is preserved in Professor HENRY'S library. On a fly-leaf is the following entry:

"This book, although by no means a profound work, has, under Providence, exerted a remarkable influence upon my life. It accidentally fell into my hands when I was about sixteen years old, and was the first work I ever read with attention. It opened to me a new world of thought and enjoyment; invested things before almost unnoticed with

the highest interest; fixed my mind on the study of nature, and caused me to resolve at the time of reading it that I would immediately commence to devote my life to the acquisition of knowledge."

The pursuit of elementary knowledge under difficulties and privations now commenced. At first he attended a night-school, where he soon learned all the master could teach. At length he entered Albany Academy, earning the means at one time by teaching a country district school, later by serving as tutor to the sons of Gen. Stephen Van Rensselaer the patroon. Then he took the direction of a road-survey across the southern portion of the State, from West Point to Lake Erie, earning a little money and much credit. He returned to Albany Academy as an assistant teacher, but was very soon, in 1828, appointed professor of mathematics. He had already chosen his field, and began to make physical investigations.

It is worth noticing that just when HENRY'S youthful resolution to devote his life to the acquisition of knowledge was ready to bear fruit, another resolve was made, in England, by another scientific investigator, James Smithson, in his will, executed in October, 1828, wherein he devoted his patrimony "TO FOUND AT WASHINGTON AN ESTABLISHMENT FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG MEN." Who could have thought that the poor lad, who resolved to seek for knowledge as for hid treasure, and the rich man of noble lineage, who resolved that his treasure should increase and diffuse knowledge, would ever stand in this interesting relation; that the one would direct and shape the establishment which the other willed to be founded!

The young professor's position was an honorable but most laborious one. Although Albany Academy was said by the distinguished president of Union College in those days to be "a college in disguise," it began its work low down. Its new professor of mathematics had to teach seven hours of every day, and for half of this time to drudge with a large class of boys in the elements of arithmetic. But he somehow found time to carry on systematically the electro-magnetic researches which he had already begun. In the very year of his appointment, 1828, he described in the Transactions of the Albany Institute a new application of the galvanic multiplier, and throughout that year and the next he carried on those investigations which, when published at the beginning of the ensuing year, January, 1831, in that notable first paper in the American Journal of Science and the Arts, at once brought HENRY'S name to the front line among the discoverers in electro-magnetism.

Sturgeon may be said to have first made an electro-magnet; HENRY undoubtedly made the electro-magnet what it is. Just after Barlow in England had declared that there could be no electric telegraph to a long distance, HENRY discovered that there could be, how and why it could be; he declared publicly its practicability, and illustrated it experimentally by setting up a telegraph with such length of wire as he could conveniently command, delivering signals at a distance by the sounding of a bell.

Previously to his investigations the means of developing magnetism in soft iron were imperfectly understood (even though the law from which they are now seen to flow had been mathematically worked out by Ohm), and the electro-magnet which then existed was inapplicable to the transmission of power to a distance. HENRY first rendered it applicable to the transmission of mechanical power to a distance; was the first actually to magnetize a piece of iron at a distance, and by it to deliver telegraphic signals. He showed what kind of battery must be employed to project the current through a great length of wire, and what kind of coil should surround the magnet used to receive this current and to do the work.*

For the telegraph, and for electro-magnetic machines, what was now wanted was not discovery, but invention, not the ascertainment of principles, but the devising of methods. These, the proper subjects of patent, have been supplied in various ways and, as to the telegraph, with wonderful efficiency;—in Europe, by the transmission of signs through the motion of a magnetic needle; in America, by the production of sounds or records by the electro-magnet. Morse was among the first to undertake the enterprise, and—when directed to the right way through Professor Gale's acquaintance with HENRY'S published researches—he carried the latter mode into practical and most successful execution. If HENRY had patented his discovery, which he was urged, but declined to do, Morse could have patented only his alphabetical mode of signaling, and perhaps the use of relay-batteries, the latter indispensable for long lines upon that system.

The scientific as well as popular effect of Professor HENRY'S first paper in Silliman's Journal was immediate and great. With the same battery that Sturgeon used he developed at least a hundred times more magnetism. The instantaneous production of magnets lifting four hun-

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*See Supplementary Note I, Leading Points in the History of the Telegraph.

dred and twenty times their own weight, of those which with less than a pint of dilute acid acting on two hands' breadth of zinc would lift seven hundred and fifty pounds, and this afterward carried up to a magnet lifting thirty-three hundred pounds, was simply astonishing. Yet it was not these extraordinary results, nor their mechanical applications, which engaged Professor HENRY'S attention so much as the prospect they opened of a way by which to ascend to higher discovery of the laws of nature. In other hands, his discoveries furnished the means by which diamagnetism, magnetic effects on polarized light, and magneto-electricity—now playing so conspicuous a part—soon came to be known. In his own hands, the immediate discovery of the induction of a current in a long wire on itself* led the way to his next fertile field of inquiry, the following up of which caused unwise tardiness in the announcement of what he had already done. For it is within our knowledge that the publication of the paper which initiated his fame had been urged for months by scientific friends, and at length was hastened by the announcement of some partly similar results reached in a different way by Moll, of Utrecht. In a letter not long afterward written to one of us, Professor HENRY had occasion to declare: "My whole ambition is to establish for myself *and to deserve* the reputation of a man of science." Yet throughout his life ardor for discovery and pure love of knowledge were unattended by corresponding eagerness for publication. At the close of that very year, 1832, however, he did announce the drawing of a spark from a magnet, that first fact in magneto-electricity, and, as he supposed, a new one. But he had been anticipated.

In May, 1830, Professor HENRY married his cousin, Harriet L. Alexander, of Schenectady, who, with three daughters, survives. Two earlier children died in infancy, and a son in early manhood.

Pleasant in most respects as his situation at Albany was, it was not an unwelcome invitation which, in the summer of 1832, it became the duty and the privilege of the most venerable of our number, then vice-president of the College of New Jersey, to give to Professor HENRY, offering him the chair of Natural Philosophy at Princeton. By this early call that college secured him for her own during the years most prolific for science. It was on a later occasion that Sir David Brewster wrote: "The mantle of Franklin has fallen upon the shoulders of HENRY." But the aureole was already visible to his fellow-workers in science;

* Announced in American Journal of Science and the Arts in 1832.

and Silliman, Renwick, and Torrey urged his acceptance of the new position, and congratulated Princeton upon the acquisition.

The professorship came to him unsought. In his last address to one of the learned societies over which he presided, Professor HENRY mentions that the various offices of honor and responsibility which he then held, nine in number, had all been pressed upon him; that he never occupied a position for which he had of his own will and action been made a candidate. It did not occur to him at that moment to make one exception. When a pupil in Albany Academy he once offered himself as a teacher of a country district school. The school trustees thought him too young, but took him on trial at eight dollars a month. At the beginning of the second month they raised his pay to fifteen.

At Princeton Professor HENRY found congenial companions and duties well suited to his powers. Here he taught and investigated for fourteen fruitful and happy years; here he professed the faith that was in him, entering into the communion of the Presbyterian Church, in which he and his ancestors were nurtured; and here he developed what might not have been expected—a genius for education. One could count on his being a clear expositor, and his gifts for experimental illustration and for devising apparatus had been already shown. But now, as a college professor, the question how to educate came before him in in a broader way. He appreciated, and he made his associates and pupils appreciate, the excellence of natural philosophy for mental discipline, for training at once both the observing and the reasoning faculties. A science which rises from the observation of the most familiar facts, and the questioning of these by experiment, to the consideration of causes, the ascertaining of laws, and to the most recondite conceptions respecting the constitution of matter and the interplay of forces, offers discipline to all the intellectual powers, and tasks the highest of them. Professor HENRY taught not only the elementary facts and general principles from a fresh survey of both, but also the methods of philosophical investigation, and the steps by which the widest generalizations and the seemingly intangible conceptions of the higher physics have been securely reached. He exercised his pupils in deducing particular results from admitted laws, and in then ascertaining whether what was thus deduced actually occurred in nature; and if not, why not. Though very few of a college class might ever afterward undertake a physical or chemical investigation, all would or should be concerned in the acquisition of truth and its relations; and by knowing

how truth was won and knowledge advanced in one field of inquiry, they would gain the aptitude which any real investigation may give, and the confidence that springs from a clear view and a sure grasp of any one subject.

He understood, as few do, the importance of analogy and hypothesis in science. Premising that hypothesis should always be founded on real analogies and used interrogatively, he commended it as the prerequisite to experiment, and the instrument by which, in the hands of sound philosophers, most discoveries have been made. This free use of hypothesis as the servant and *avant-courier* of research—as means rather than end—is a characteristic of HENRY. His ideas on the subject are somewhat fully and characteristically expounded by himself in his last presidential address to the Philosophical Society of Washington—one which he evidently felt would be the last.

How HENRY was valued, honored, revered at Princeton, the memorial published by his former associates there feelingly declares. What he did there for science in those fourteen years would be long to tell and difficult to make clear without entering into details, here out of place. Happily the work has been done to our hand by the Professor himself, several years ago, in a communication which is printed in the index volume of the Princeton Review, and reprinted in the Princeton Memorial. This careful and conscientious, though cursory, analysis of the principal researches of that period we propose to append to this record.* There is also in preparation, by a competent scientific hand, a detailed list of all Professor HENRY'S contributions to science, which we desire likewise to append.†

One of these, of the Princeton period, ought to be mentioned. It is upon the origin of mechanical power and its relations to vital force. It is a characteristic example of Professor HENRY'S happy mode of treating a scientific topic in an untechnical way. It also illustrates his habit of simply announcing original ideas without putting them prominently forward in publication, as any one who was thinking of himself and of his own fame would be sure to do. The doctrine he announced was communicated to the American Philosophical Society in 1844 in brief outlines. He developed it further in an article published in the Patent Office Report for 1856, twelve years later; a medium of publication which was naturally overlooked. Only at a friend's desire was the paper re-

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* See Supplementary Note II. A Letter from Professor Henry.

† See Supplementary Note III. A List of Professor Henry's Scientific Papers.

produced, in 1860, in the American Journal of Science, where it would be noticed. The attention of Professor HENRY was turned to the topic (as we happen to know) by an abstract which was given to him of Dumas' celebrated lecture, in 1841, on the Chemical Statics of Organized Beings. If he had published in 1844, with some fullness, as he then wrought them out, his conception and his attractive illustrations of the sources, transformation, and equivalence of mechanical power, and given them fitting publicity, HENRY'S name would have been prominent among the pioneers and founders of the modern doctrine of the conservation of energy.

In the year 1837 Professor HENRY first visited Europe, and came into personal communication with the principal men of science of England, Scotland, and France. One of us had the pleasure, a few years afterward, of hearing Faraday speak of HENRY in terms of hearty regard and admiration. The two men were in some respects alike, wholly alike in genuine simplicity of character and in disinterested devotion to scientific discovery. They were then rival investigators in the same line; and the race for a time was not unequal, considering how HENRY was weighted with onerous professional work. For Faraday, while that most acute mind retained its powers, there was the congenial life of pure research, undistracted by cares of administration or of instruction, beyond a few popular lectures; supplied with every means of investigation; stimulated by the presence or proximity of many fellow-workers; rewarded by discovery after discovery, and not unconscious of the world's applause—such was the enviable life of the natural philosopher favorably placed. But in this country, where fit laborers are few, duty rather than inclination must determine their work. Midway in his course Professor HENRY was called to exchange a position which allowed the giving of considerable time to original researches, for one of greater prominence, in which these had practically to be abandoned. Not, indeed, that this was assuredly expected, but it was contemplated as probable. And the event justified the apprehension, while it opened other fields of not inferior usefulness.

In August, 1846, the act of Congress establishing the Smithsonian Institution was passed and approved. On the 7th of September ensuing the Regents held their first meeting. On the 3d of December following they resolved:

"That it is essential for the advancement of the proper interests of the trust that the Secretary of the Smithsonian Institution be a man

possessing weight of character and a high grade of talent; and that it is further desirable that he possess eminent scientific and general acquirements; that he be a man capable of advancing science and promoting letters by original research and effort, well qualified to act as a respected channel of communication between the Institution and scientific and literary individuals and societies in this and foreign countries; and, in a word, a man worthy to represent before the world of science and letters the Institution over which this Board presides."

Immediately following the adoption of this resolution, Professor JOSEPH HENRY, of Princeton, was elected Secretary. On the 14th of December a letter was read from him accepting the appointment. At the meeting a week later, he appeared and entered upon the duties of his office. From this time the biography of Professor HENRY is the history of the Institution. That history is set forth in the Secretary's annual reports, presented by the Board of Regents to Congress, and it need not be recapitulated. A few words may give some idea of the deep impression he made upon the Institution while it was yet plastic.

Some time before his appointment he had been requested by members of the Board of Regents to examine the will of Smithson, and to suggest a plan of organization by which the object of the bequest might, in his opinion, best be realized. He did so, and the plan he drew was in their hands when he was chosen Secretary. As he himself summed it up, the plan was based on the conviction "that the intention of the donor was to advance science by original research and publication; that the establishment was for the benefit of mankind generally, and that all unnecessary expenditures on local objects would be violations of the trust." The plan proposed was, in the leading feature, "to assist men of science in making original researches, to publish them in a series of volumes, and to give a copy of these to every first-class library on the face of the earth."

His "Plan of Organization," filled out in its details and adjusted to the conditions prescribed by the law and by the action of the Regents, was submitted to the Board in the following year, was adopted as its "governing policy," and it has been reprinted, in full or in part, in almost every annual report. All would understand, therefore, that Professor HENRY'S views were approved, and that they would be carried into effect as far and as fast as they commended themselves to the judgment of the Regents, and as opportunity made them practicable.

If the Institution is now known and praised throughout the world of science and letters, if it is fulfilling the will of its founder and the reason-

able expectations of the nation which accepted and established the trust, the credit is mainly due to the practical wisdom, the catholic spirit, and the indomitable perseverance of its first Secretary, to whom the establishing act gave much power of shaping ends which, as rough-hewn by Congress, were susceptible of various diversion. For Congress, in launching, did not shape the course of the Institution, except in a general way. And in intrusting its guidance to the Regents, the law created only one salaried and permanent officer, the Secretary, on whom, by its terms and by the conditions of the case, it devolved great responsibility and commensurate influence. Some of us are old enough to remember the extreme diversity of opinion in Congress over the use to be made of Smithson's legacy. One party, headed by an eminent statesman and Ex-President, endeavored to found with it an astronomical observatory, for which surely the country need not be indebted to a foreigner. A larger party strove to secure it for a library; not, probably because they deemed that use most relevant to the founder's intention, but because rival schemes might fritter away the noble bequest in popular lecturing, itinerant or stationary, of which the supply and the quality are in this country equal to the demand; or in the dissemination of elementary knowledge by the printing-press, as if that were beyond the reach of private enterprise; or in setting up one more college, university, or other educational establishment on half an endowment; or in duplicating museums and cabinets, which, when supported by a fixed capital, necessarily soon reach the statical condition in which all the income is absorbed in simply taking care of what has been accumulated.

Congress rejected, one after the other, the schemes for making of the Institution an observatory, a library, a normal school, and a lecturing establishment, with professors at Washington. It created a Board of Regents, charged it with the care of the collections and museums belonging to the United States; authorized the expenditure, if the Regents saw fit, of a sum not exceeding twenty-five thousand dollars annually for the formation of a library; and in all else it directed them to make such disposal of the income "as they shall deem best suited for the promotion of the purpose of the testator."

Under this charter, and with the course of the Institution still to be marked out, it is not surprising that the official adviser and executive of the Board should look to the will of Smithson for the controlling interpretation of the law. He knew, moreover, that in an earlier will

Smithson had bequeathed his fortune to the Royal Society of London, an institution expressly for the furtherance of scientific research; and that he changed, as we may say, the trusteeship for a purely personal reason. HENRY took his stand on the broad and simple terms of the bequest, "for the increase and diffusion of knowledge among men." And he never—

Narrowed his mind,
And *to locality* gave what was meant for mankind.

He proposed only one restriction, of obvious wisdom and necessity, that, in view of the limited means of the Institution, it ought not to undertake anything which could be done, and well done, by other existing instrumentalities. So, as occasion arose, he lightened its load and saved its energies by giving over to other agencies some of its cherished work—meteorology, for instance, in which a most popular bureau now usefully expends many times more than the whole Smithsonian income.

He has in these last years signified his desire to go still further in this direction, and to have the Institution relieved from the charge of the National Museum, now of imperial dimensions and importance. His reasons were summed up in few words in his last report, along with his synopsis of the appropriate functions of the Institution, which he prays may not be merged in or overshadowed by any establishment of the Government, but may stand "free to the unobstructed observation of the whole world, keeping in perpetual remembrance the will of its founder." Its true functions he declares are:

"First. To enlarge the bounds of human thought by assisting men of science to make original investigations in all branches of knowledge; to publish these, and to present copies to all the principal libraries of the world. Second. To institute investigations in various branches of science, and explorations for the collection of specimens in natural history and ethnology, to be distributed to museums and other establishments. Third. To diffuse knowledge by carrying on an extended international series of exchanges by which the accounts of all the original researches in science, the educational progress, and the general advance of civilization in the New World are exchanged for similar works of the Old World."

The plan which our late Secretary originated has commended itself to the judgment of successive Boards of Regents, and, we may be permitted to add, is now approved wherever it is known and understood.

Professor HENRY took his full share of the various honorable duties to which such men are called. He was in his turn President of the American Association for the Advancement of Science, in the year 1849;

of the Society for the Advancement of Education, in 1855; a Trustee of Princeton College, and of Columbian University, also of the Corcoran Gallery of Art, in which the Smithsonian Institution deposits its art collections; Visitor of the Government Hospital for the Insane; President of the Philosophical Society of Washington; President of the National Academy of Sciences at Washington. For many years a member of the Light-House Board, to which he gave gratuitous and invaluable services as Chairman of its committee on experiments, he added for the last seven years the chairmanship of the board itself, in his administration no sinecure. Advice and investigation were sought from him, from time to time, by every department of Government. All were sure that his advice was never biased by personal interest; and his sound judgment, supported by spotless character, was greatly deferred to.

We have said that in coming to Washington a career of investigation was exchanged for a life of administration. It should rather be said that his investigations thereafter took a directly practical turn, as his mind was brought to bear upon difficult questions of immediate importance which were referred to him by Government or came in the course of official duty. In the light-house service alone his timely experiments upon lard-oil lighting, and the firmness with which he pressed his conclusions into practice when sperm-oil became dear, has already saved more than a million of dollars; the adaptation of mineral oil to the lesser lights made another great saving; and the results reached by his recent investigations of the conditions which influence the transmission of sound and their application to acoustical signaling are not to be valued by the saving of money only.

It was in the prosecution of these last investigations, over a year ago, and probably in consequence of exposure in them, at the light-house station on Staten Island, that an intimation of the approaching end of these labors was received. Yet a few months more of useful life were vouchsafed to him, not free from suffering, but blessed with an unclouded mind and borne with a serene spirit; and then, at midday on the 13th of May last, the scene was closed.

At the sepulture of his remains (on the 16th) and afterward, it was generally remarked at Washington that never before had the funeral of a private citizen called forth such sense of loss, such profound demonstrations of respect and affection.

It is not for us to assign Professor HENRY'S place among the men of science of our time. Those who do this will probably note that his

American predecessors were Franklin and Rumford; that all three were what we call self-made men; that all three, after having proved their talents for original investigation in physics, were called in their mature years to duties of administration and the conduct of affairs. There are interesting parallels to be drawn from their scientific work, if one had time to trace them.

Not often is a great man of science a good man of business. HENRY'S friends at Princeton, who besought him not to abandon the peaceful academic life which he was enjoying and the quiet pursuits which had given him fame, were surprised when in another sphere he developed equal talents for organization and administration. We have seen how he always developed the talent to do wisely and well whatever he undertook. His well-poised spirit, at once patient and masterful, asserted itself in the trials he encountered in the early years of the Institution, and gave assurance that he could deal with men as well as with the forces of nature.

Again, not often is a man of science free from the overmastering influence of his special pursuit. More or less his "nature is subdued to what it works in, like the dyer's hand." Now, HENRY'S mind was uncolored by the studies of his predilection. His catholic spirit comes out in his definition of science: "Science is the knowledge of the laws of phenomena, whether they relate to mind or matter." It appears in his choice of the investigations to be furthered and memoirs to be published by the Institution. These nowhere show the bias of a specialist.

Then, he was a careful, painstaking man, very solicitous—perhaps unduly anxious—about the particulars of everything for which he felt responsible. Therefore he was sometimes slow in making up his mind on a practical question. May we here condescend to a trivial anecdote of his early boyhood, which he amusingly related to one of us many years ago and pleasantly recalled at one of our latest interviews. It goes back to the time when he was first allowed to have a pair of boots, and to choose for himself the style of them. He was living with his grandmother in the country, and the village Crispin could offer no great choice of patterns; indeed, it was narrowed down to the alternative of round toes or square. Daily the boy visited the shop and pondered the alternatives, even while the manufacture was going on, until at length the shoemaker, who could brook no more delay, took the dilemma by both horns and produced the most remarkable pair of boots the wearer ever had; one boot round-toed, the other square-toed.

Deliberate as HENRY was in after years, taught by this early lesson, he probably never again postponed decision till it was too late to choose. One result of due deliberation was that he rarely had to change his mind. When he had taken his course, he held to it. His patience and kindness under demands upon his time were something wonderful. Some men are thus patient from easy good-nature; HENRY was so from principle. A noticeable part of the Secretary's correspondence was with a class of men—more numerous than would be supposed—who thought they had discovered new laws of nature or new applications of them, and who appealed to him to make their discoveries known. The Secretary never returned a curt answer to such appeals or inquiries, whether made personally or by letter. Many are the hours which he would conscientiously devote to such paradoxical schemes—sometimes of wonderful ingenuity—and to the dictation of elaborate replies to them. Detecting far down in the man's mind the germs of the fallacy which had misled him, he would spare no pains to present it and its consequences so plainly to his bewildered correspondent that he could find his own way out of it; while at the same time he awarded credit and encouragement for whatever was true, probable, or ingenious.

Although of sensitive spirit and with a just sense of what was due to himself, Professor HENRY kept free from controversy. Once he took up the pen, not because his discoveries were set at naught, but because his veracity was impliedly assailed. His dignified recital of undeniable facts (in his Annual Report for 1857) was all that was necessary, and not even a word of indignant comment was added.

He left his scientific work to form its part of the history of science and to be judged by scientific men. The empiric he once sententiously defined to be "one who appeals his cause to an incompetent tribunal." He never courted publicity; not from fastidious dislike, still less from disdain of well-earned popular applause, but simply because he never thought of it.

His disinterested devotion to this Institution was shown in many ways; among others in successive refusals to accept increase of salary lest it should be thought that the office he held was lucrative. Twice or thrice, moreover, while cumbered with anxieties, he promptly declined calls to positions of greater emolument, less care, and abundant leisure for the pursuits he loved.

We cannot here continue these delineations, and it may be that the character of the man has portrayed itself in general outlines as the

narrative proceeded. But one trait may not be wholly omitted from the biography of one who has well been called "the model of a Christian gentleman," and who is also our best example of a physical philosopher. His life was the practical harmony of the two characters. His entire freedom from the doubts which disturb some minds is shown in that last letter which he dictated, in which he touches the grounds of faith both in natural and revealed religion; also in his sententious declaration upon some earlier occasion, that the person who thought there could be any real conflict between science and religion must be either very young in science or ignorant of religion.

The man for whom this memorial is placed was a veteran in both; was one of that noble line of natural philosophers for whom we may in all sincerity render to Almighty God hearty thanks, not only for the good example and fruit of their lives, but also that, having finished their course in faith, they do now rest from their labors.

SUPPLEMENTARY NOTES.

NOTE I.

SEQUENCE OF DISCOVERY AND INVENTION RESULTING IN THE ELECTRO-MAGNETIC TELEGRAPH.

The following appear to be the main points in the order of discovery which led to the electro-magnetic telegraph. They are here condensed from Professor Henry's "Statement", in the "Proceedings of the Regents", published in the Smithsonian Report for the year 1857, and from a note appended by Mr. William B. Taylor to his "Memoir of Joseph Henry and his Scientific Work," read before the Philosophical Society of Washington.

1819–1820. Oersted showed that a magnetic needle is deflected by the action of a current of galvanic electricity passing near it. It appears that this discovery had already been made as early as the year 1802, by Romagnesi, and published in 1805.

1820. Arago discovered that while a galvanic current is passing through a copper wire it is capable of developing magnetism in soft iron.

1820. Ampère discovered that two wires through which currents are passing in the same direction attract, and in opposite directions repel, each other; and thence he inferred that magnetism consists in the attraction of electrical currents revolving at right angles to the line joining the two poles of the magnet, and is produced in a bar of steel or iron by induction from a series of electrical currents revolving in the same direction at right angles to the axis of the bar.

1820. Schweigger in the same year produced the galvanometer.

1825. Sturgeon made the electro-magnet by bending the bar, or rather a piece of iron wire, into the form of a horse-shoe, covering it

with varnish to insulate it, and surrounding it with a helix of wire the turns of which were at a distance.

1829–1830. Henry, in accordance with the theory of Ampère, produced the intensity or spool-wound magnet, insulating the wire instead of the rod or bar, and covering the whole surface of the iron with a series of coils in close contact. He extended the principle to the full by winding successive strata of insulated wire over each other, thus producing a compound helix formed of a long wire of many coils. At the same time he developed the relation of the intensity magnet to the intensity battery, and their relations to the magnet of quantity. He thus made the electro-magnet capable of transmitting power to a long distance, demonstrated the principle and perfected the magnet applicable to the purpose, was the first actually to magnetize a piece of iron at a distance, and to demonstrate and declare the applicability of the electro-magnet to telegraphy at a distance. Using the terminal short-circuit magnet of quantity and the armature as the signaling device, he was the first to make by it acoustic signals, sounding a bell at a distance by means of the electro-magnet.

1833. Weber discovered that the conducting-wires of an electric telegraph could be left without insulation except at the points of support.

1833. Gauss ingeniously arranged the application of a dual sign in such manner as to produce a true alphabet for telegraphy.

1836. Daniel invented and brought into use a constant galvanic battery.

1837. Steinheil discovered that the earth may form the returning half of the circuit, so that a single conducting wire suffices for telegraphy.

1837. Morse adopted, through the agency of Dr. Gale, the principle of the Henry electro-magnet, and the armature made of a recording instrument.

1838. Morse devised his "dot and dash" alphabet, a great improvement upon the Gauss and Steinheil alphabets.

1844. Morse suggested and brought into use the system of relay-magnets, and relay-circuits, to re-einforce the current.

NOTE II.

LETTER FROM PROFESSOR HENRY TO THE REV. S. B. DOD, GIVING A SKETCH OF SCIENTIFIC RESEARCHES AT PRINCETON.

[From the Princeton Memorial of Professor Henry.]

MY DEAR SIR: In compliance with your request that I would give an account of my scientific researches during my connection with the College of New Jersey, I furnish the following brief statement of my labors within the period mentioned:

I. Previous to my call from the Albany Academy to a professorship in the College of New Jersey, I had made a series of researches on electro-magnetism, in which I developed the principles of the electro-magnet and the means of accumulating the magnetic power to a great extent, and had also applied this power in the invention of the first electro-magnetic machine; that is, a mechanical contrivance by which electro-magnetism was applied as a motive power.

I soon saw, however, that the application of this power was but an indirect method of employing the energy derived from the combustion of coal, and, therefore, could never compete, on the score of expense, with that agent as a means of propelling machinery, but that it might be used in some cases in which expense of power was not a consideration to be weighed against the value of certain objects to be attained.

A great amount of labor has since been devoted to this invention, especially at the expense of the Government of the United States, by the late Dr. Page, but it still remains in nearly the same condition it was left in by myself in 1831.

I also applied, while in Albany, the results of my experiments to the invention of the first electro-magnetic telegraph, in which signals were transmitted by exciting an electro-magnet at a distance, by which means bells were struck in succession, capable of indicating letters of the alphabet.

In the midst of these investigations I was called to Princeton, through the nomination of Dr. Jacob Green, then of Philadelphia, and Dr. John Torrey, of New York.

I arrived in Princeton in November, 1832, and as soon as I became fully settled in the chair which I occupied, I recommenced my investigations, constructed a still more powerful electro-magnet than I had made before—one which would sustain over 3,000 pounds—and with it illustrated to my class the manner in which a large amount of power might, by means of a relay-magnet, be called into operation at the distance of many miles.

I also made several modifications in the electro-magnetic machine before mentioned, and just previous to my leaving for England, in 1837, again turned my attention to the telegraph. I think the first actual line of telegraph using the earth as a conductor, was made in the beginning of 1836. A wire was extended across the front campus of the college grounds, from the upper story of the library building to the philosophical hall on the opposite side, the ends terminating in two wells. Through this wire, signals were sent from time to time from my house to my laboratory. The electro-magnetic telegraph was first invented by me, in Albany, in 1830. Professor Morse, according to his statements, conceived the idea of an electro-magnetic telegraph in his voyage across the ocean in 1832, but did not until several years afterward—1837—attempt to carry his ideas into practice; and when he did so, he found himself so little acquainted with the subject of electricity that he could not make his simple machine operate through the distance of a few yards. In this dilemma he called in the aid of Dr. Gale, who was well acquainted with what I had done in Albany and Princeton, having visited me at the latter place. He informed Professor Morse that he had not the right kind of a battery nor the right kind of magnets, whereupon the professor turned the matter over to him, and, with the knowledge he had obtained from my researches, he was enabled to make the instrument work through a distance of several miles. For this service Professor Morse gave him a share of his patent, which he afterwards purchased from him for $15,000. At the time of making my original experiments on electro-magnetism in Albany, I was urged by a friend to take out a patent, both for its application to machinery and to the telegraph, but this I declined, on the ground that I did not then consider it compatible with the dignity of science to confine the benefits which might be derived from it to the exclusive use of any individual. In this, perhaps, I was too fastidious. In briefly stating my claims to the invention of the electro-magnetic telegraph, I may say I was the first to bring the

electro-magnet into the condition necessary to its use in telegraphy, and also to point out its application to the telegraph, and to illustrate this by constructing a working telegraph, and, had I taken out a patent for my labors at that time, Mr. Morse could have had no ground on which to found his claim for a patent for his invention. To Mr. Morse, however, great credit is due for his alphabet, and for his perseverance in bringing the telegraph into practical use.

II. My next investigation, after being settled at Princeton, was in relation to electro-dynamic induction. Mr. Faraday had discovered that when a current of galvanic electricity was passed through a wire from a battery, a current in an opposite direction was induced in a wire arranged parallel to this conductor. I discovered that an induction of a similar kind took place in the primary conducting wire itself, so that a current which, in its passage through a short wire conductor, would neither produce sparks nor shocks, would, if the wire were sufficiently long, produce both these phenomena. The effect was most strikingly exhibited when the conductor was a flat ribbon, covered with silk, rolled into the form of a helix. With this, brilliant deflagrations and other electrical effects of high intensity were produced by means of a current from a battery of low intensity, such as that of a single element.

III. A series of investigations was afterward made, which resulted in producing inductive currents of different orders, having different directions, made up of waves alternately in opposite directions. It was also discovered that a plate of metal of any kind, introduced between two conductors, neutralized this induction, and this effect was afterward found to result from a current in the plate itself. It was afterward shown that a current of quantity was capable of producing a current of intensity, and, *vice versa*, a current of intensity would produce one of quantity.

IV. Another series of investigations, of a parallel character, was made in regard to ordinary or frictional electricity. In the course of these it was shown that electro-dynamic inductive action of ordinary electricity was of a peculiar character, and that effects could be produced by it at a remarkable distance. For example, if a shock were sent through a wire on the outside of a building, electrical effects could be exhibited in a parallel wire within the building. As another illustration of this, it may be mentioned that when a discharge of a battery of several Leyden jars was sent through the wire before mentioned, stretched across the campus in front of Nassau Hall, an inductive effect was produced in a parallel wire, the ends of which terminated in the plates of metal in the ground in the back campus, at a distance of several hundred feet from the primary current, the building of Nassau Hall intervening. The effect produced consisted in the magnetization of steel needles.

In this series of investigations, the fact was discovered that the induced current, as indicated by the needles, appeared to change its direction with the distance of the two wires, and other conditions of the experiment, the cause of which for a long time baffled inquiry, but was finally satisfactorily explained by the discovery that the discharge of electricity from a Leyden jar is of an oscillatory character, a principal discharge taking place in one direction, and immediately afterward a rebound in the opposite, and so on forward and backward, until the equilibrium is obtained.

V. The next series of investigations related to atmospheric induction. The first of these consisted of experiments with two large kites, the lower end of the string of one being attached to the upper surface of a second kite, the string of each consisting of a fine wire, the terminal end

of the whole being coiled around an insulated drum. I was assisted in these experiments by Mr. Brown, of Philadelphia, who furnished the kites. When they were elevated, at a time when the sky was perfectly clear, sparks were drawn of surprising intensity and pungency, the electricity being supplied from the air, and the intensity being attributed to the induction of the long wire on itself.

VI. The next series of experiments pertaining to the same class was on the induction from thunder clouds. For this purpose the tin covering of the roof of the house in which I resided was used as an inductive plate. A wire was soldered to the edge of the roof near the gutter, was passed into my study and out again through holes in the window-sash, and terminated in connection with a plate of metal in a deep well immediately in front of the house. By breaking the continuity of that part of the wire which was in the study, and introducing into the opening a magnetizing spiral, needles placed in this could be magnetized by a flash of lightning so distant that the thunder could scarcely be heard. The electrical disturbance produced in this case was also found to be of an oscillatory character, a discharge first passing through the wire from the roof to the well, then another in the opposite direction, and so on until equilibrium was restored. This result was arrived at in this case, as well as in that of the Leyden jar, before mentioned, by placing the same, or a similar needle, in succession, in spirals of greater and greater numbers of turns; for example, in a spiral of a single turn the needle would be magnetized *plus*, or in the direction due to the first and more powerful wave. By increasing the number of coils, the action of the second wave became dominant, so that it would more than neutralize the magnetism produced by the first wave, and leave the needle *minus*. By farther increasing the number of turns, the third wave would be so exalted as to neutralize the effects of the preceding two, and so on. In the case of induction by lightning, the same result was obtained by placing a number of magnetizing spirals, of different magnetizing intensities, in the opening of the primary conductor, the result of which was to produce the magnetization of an equal number of needles, plus and minus, indicating alternate currents in opposite directions.

VII. In connection with this class of investigations a series of experiments was made in regard to lightning-rods. It was found that when a quantity of electricity was thrown upon a rod, the lower end of which was connected with a plate of metal sunk in the water of a deep well, that the electricity did not descend silently into water, but that sparks could be drawn from every part of the rod sufficiently intense to explode an electrical pistol, and to set fire to delicate inflammable substances. The spark thus given off was found to be of a peculiar character, for while it produced combustion and gave a slight shock, and fired the electrical pistol, it scarcely at all affected a gold-leaf electroscope. Indeed, it consisted of two sparks, one from the conductor and the other to it, in such quick succession, that the rupture of the air by the first served for the path of the second. The conclusion arrived at was, that during the passage of the electricity down the rod, each point in succession received a charge analogous to the statical charge of a prime conductor, and that this charge, in its passage down the rod, was immediately preceded by a negative charge; the two in their passage past the point at which the spark was drawn, giving rise to its duplex character. It was also shown by a series of experiments in transmitting a powerful discharge through a portion of air, that the latter, along the path of discharge, was endowed for a moment with an intense repulsive energy. So great is this that in one instance, when an electrical discharge from

the clouds passed between two chimneys through the cockloft of a house, the whole roof was lifted from the walls. It is to this repulsive energy, or tendency in air to expand at right angles to the path of a stroke of lightning, that the mechanical effects which accompany the latter are generally to be attributed.

In connection with this series of investigations an experiment was devised for exhibiting the screening effect, within a space inclosed with a metallic envelope, of an exterior discharge of electricity. It consisted in coating the outside of a hollow glass globe with tinfoil and afterward inserting, through a small hole in the side, a delicate gold-leaf electrometer. The latter, being observed through a small opening in the tinfoil, was found to be unaffected by a discharge of electricity passed over the outside coating.

VIII. Another series of investigations was on the phosphorogenic emanation from the sun. It had long been known that, when the diamond is exposed to the direct rays of the sun, and then removed to a dark place, it emits a pale blue light, which has received the name of phosphorescence. This effect is not peculiar to the diamond, but is possessed by a number of substances, of which the sulphuret of lime is the most prominent. It is also well known that phosphorescence is produced by exposing the substance to the electric discharge. Another fact was discovered by Becquerel, of the French Institute, that the agent exciting phosphorescence traverses with difficulty a plate of glass or mica, while it is transmitted apparently without impediment through plates of black quartz impervious to light.

My experiments consisted, in the first place, in the reproduction of these results, and afterward in the extension of the list of substances which possess the capability of exhibiting phosphorescence, as well as the effects of different interposed media. It was found that, among a large number of transparent solids, some were permeable to the phosphorescing agent, and others impermeable, or imperfectly permeable. Among the former were ice, quartz, common salt, alum. Among the latter class, mica, tourmaline, camphor, &c. Among liquid permeable substances were water, solutions of alum, ammonia; while among the impermeable liquids were most of the acids, sulphate of zinc, sulphate of lead, alcohol, &c.

It was found that the emanation took place from every point of the line of the electric discharge, but with more intensity from the two extremities; and also, that the emanation producing phosphorescence, whatever be its nature, when reflected from a mirror, obeys the laws of the reflection of light, but no reflection was obtained from a surface of polished glass. It is likewise refracted by a prism of rock salt, in accordance with the laws of the refraction of light. By transmitting the rays from an electrical spark through a series of very thin plates of mica, it was shown that the emanation was capable of polarization, and, consequently, of double refraction.

IX. The next series of investigations was on a method of determining the velocity of projectiles. The plan proposed for this purpose consisted in the application of the instantaneous transmission of electrical action to determine the time of the passage of the ball between two screens, placed at a short distance from each other in the path of the projectile. For this purpose the observer is provided with a revolving cylinder moving by clock-work at a uniform rate, and of which the convex surface is divided into equal parts indicating a fractional part of a second. The passage of the ball through the screen breaks a galvanic circuit, the time of which is indicated on the revolving cylinder

by the terminal spark produced in a wire surrounding a bundle of iron wires. Since the publication of this invention various other plans founded on the same principle have been introduced into practice.

X. Another series of experiments was in regard to the relative heat of different parts of the sun's disk, and especially to that of the spots on the surface. These were made in connection with Prof. S. Alexander, and consisted in throwing an image of the sun on a screen in a dark room by drawing out the eye-piece of a telescope. Through a hole in the screen the end of a sensitive thermo-pile was projected, the wires of which were connected with a galvanometer. By slightly moving the smaller end of the telescope different parts of the image of the sun could be thrown on the end of the thermo-pile, and by the deviation of the needle of the galvanometer the variation of the heat was indicated. In this way it was proved that the spots radiated less heat than the adjacent parts, and that all parts of the sun's surface did not give off an equal amount of heat.

XI. Another series of experiments was made with what was called a thermal telescope. This instrument consisted of a long hollow cone of pasteboard, lined with silver leaf and painted outside with lampblack. The angle at the apex of this cone was such as to cause all the parallel rays from a distant object entering the larger end of the cone to be reflected on to the end of a thermo-pile, the poles of which were connected with a delicate galvanometer. When the axis of this conical reflector was directed toward a distant object of greater or less temperature than the surrounding bodies, the difference was immediately indicated by the deviation of the needle of the galvanometer. For example, when the object was a horse in a distant field the radiant heat from the animal was distinctly perceptible at a distance of at least several hundred yards. When this instrument was turned toward the celestial vault the radiant heat was observed to increase from the zenith downward; when directed, however, to different clouds, it was found to indicate in some cases a greater and in others a less degree of radiation than the surrounding space. When the same instrument was directed to the moon a slight increase of temperature was observed over that of the adjacent sky, but this increase of heat was attributed to the reflection of the heat of the sun from the surface of the moon, and not to the heat of the moon itself. To show that this hypothesis is not inconsistent with the theory that the moon has cooled down to the temperature of celestial space, a concave mirror was made of ice, and a thermo-pile placed in the more distant focus. When a flame of hydrogen, rendered luminous by a spiral platinum wire, was placed in the other focus, the needle of the galvanometer attached to the pile indicated a reflection of heat, care being taken to shade the pile by a screen with a small opening introduced between it and the flame.

XII. Another series of experiments connected with the preceding may be mentioned here. It is well known that the light from a flame of hydrogen is of very feeble intensity. The same is the case with that of the compound blowpipe, while the temperature of the latter is exceedingly high, sufficiently so to melt fine platinum wire. It is also well known that by introducing lime or other solid substance into this flame its radiant light is very much increased. I found that the radiant heat was increased in a similar ratio, or, in other words, that in such cases the radiant heat was commensurate with the radiant light, and that the flame of the compound blowpipe, though of exceedingly high temperature, is a comparatively cool substance in regard to radiant heat. To study the relation of the temperature of a flame to the amount of heat

given off, four ounces of water were placed in a platinum crucible and supported on a ring-stand over a flame of hydrogen; the minutes and seconds of time were then accurately noted which were required for the raising of the water from the temperature of 60° to the boiling point. The same experiment was repeated with an equal quantity of water, with the same flame, into which a piece of mica was inserted by a handle made of a narrow slip of the same substance. With this arrangement the light of the flame was much increased, while the time of bringing the water to the boiling point was also commensurately increased, thus conclusively showing that the increase of light was at the expense of the diminution of the temperature. These experiments were instituted in order to examine the nature of the fact mentioned by Count Rumford, that balls of clay introduced into a fire under some conditions increase the heat given off into an apartment. From the results just mentioned it follows that the increase in the radiant heat, which would facilitate the roasting of an article before the fire, would be at the expense of the boiling of a liquid in a vessel suspended directly over the point of combustion.

XIII. Another investigation had its origin in the accidental observation of the following fact: A quantity of mercury had been left undisturbed in a shallow saucer, with one end of a piece of lead wire, about the diameter of a goose-quill, and six inches long, plunged into it, the other end resting on the shelf. In this condition it was found, after a few days, that the mercury had passed through the solid lead, as if it were a siphon, and was lying on the shelf still in a liquid condition. The saucer contained a series of minute crystals of an amalgam of lead and mercury. A similar result was produced when a piece of the same lead wire was coated with varnish, the mercury being transmitted without disturbing the outer surface.

When a length of wire of five feet was supported vertically, with its lower end immersed in a vessel of mercury, the liquid metal was found to ascend, in the course of a few days, to a height of three feet. These results led me to think that the same property might be possessed by other metals in relation to each other. The first attempt to verify this conjecture was made by placing a small globule of gold on a plate of sheet-iron and submitting it to the heat of an assaying furnace, but the experiment was unsuccessful, for, although the gold was heated much beyond its melting point, it showed no signs of sinking into the pores of the iron. The idea afterward suggested itself that a different result would have been obtained had the two metals been made to adhere to each other, so that no oxide could form between the two surfaces. To verify this a piece of copper, thickly plated with silver, was heated to near the melting point of the metals, when the silver disappeared, and, after the surface was cleaned with diluted sulphuric acid, it presented a uniform surface of copper. This plate was next immersed for a few minutes in a solution of muriate of zinc, by which the surface of copper was removed and the surface of silver again exposed. The fact had long been observed by workmen in silver-plating that, in soldering the parts of plated metal, if care be not taken not to heat them unduly, the silver will disappear. This effect was supposed to be produced by evaporation, or the burning off, as it was called, of the plating. It is not improbable that a slow diffusion of one metal into the other takes place in the case of an alloy. Silver coins slightly alloyed with copper, after having lain long in the earth, are found covered with a salt of copper. This may be explained by supposing that the alloy of copper at the surface of the coin enters into combination with the carbonic acid of the

soil, and, being thus removed, its place is supplied by a diffusion from within, and so on; it is not improbable that a large portion of the alloy may be removed in progress of time, and the purity of the coin be considerably increased. It is known to the jeweler that articles of copper plated with gold lose their brilliancy after a while, and that this can be restored by boiling them in ammonia. This effect is probably produced by the ammonia acting on the copper and dissolving off its surface so as to expose the gold, which by diffusion had penetrated into the body of the metal.

The slow diffusion of one metal into another at ordinary temperatures, would naturally require a long time to produce a perceptible effect, since it is probably only produced by the minute vibrations of the particles due to variations of temperature.

The same principle is applied to the explanation of the phenomenon called segregation—such as the formation of nodules of flint in masses of carbonate of lime; or, in other words, to the explanation of the manner in which the molecular action, which is insensible at perceptible distances, may produce results which would appear, at first sight, to be the effect of attraction acting at a distance.

XIV. Another series of experiments had reference to the constitution of matter in regard to its state of liquidity and solidity, and they had their origin in the examination of the condition of the metal of the large gun constructed under the direction of Captain Stockton, by the explosion of which several prominent members of the United States Government were killed at Washington. It was observed in testing the bars of iron made from this gun, that they varied much in tensile strength in different parts, and that, in breaking these bars, the solution of the continuity took place first in the interior. This phenomenon was attributed to the more ready mobility of the outer molecules of the bars, the inner ones being surrounded by matter incapable of slipping, and hence the rupture. A similar effect is produced in a piece of thick copper wire, each end, when broken, exhibiting, at the point of rupture, a cup-shaped surface, showing that the exterior of the metal sustained its connection longer than the interior. From these observations the conclusion was drawn, that rigidity differs from liquidity more in a polarity which prevents slipping of the molecules, than in a difference of the attractive force with which the molecules are held together; or that it is more in accordance with the phenomena of cohesion to suppose that, in the case of a liquid, instead of the attraction of the molecules being neutralized by heat, the effect of this agent is merely to neutralize the polarity of the molecules, so as to give them perfect freedom of motion around any imaginable axis. In illustration of this subject, the comparative tenacity of pure water and water in which soap had been dissolved was measured by the usual method of ascertaining the weight required to detach from the surface of each the same plate of wood, suspended from the beam of a balance, under the same condition of temperature and pressure. It was found, by this experiment, that the tenacity of pure water was greater than that of soap and water. This novel result is in accordance with the supposition that the mingling of the soap and the water interferes with the perfect mobility of the molecules, while at the same time it diminishes the attraction.

XV. A series of experiments was also made on the tenacity of soap in films. For this purpose sheets of soap-water films were stretched upon rings, and the attempt made to obtain the tenacity of these by placing on them pellets of cotton until they were ruptured. The thickness of these films was roughly estimated by Newton's scale of the colors of thin

plates, and from the results the conclusion was arrived at that the attractive force of the molecules of water, for those of water, is approximately equal to that of the molecules of ice for those of ice, and that the difference in this case, of the solidity and liquidity, is due to the want of mobility in the latter, which prevented the slipping of the molecules on each other. It is this extreme mobility of the molecules of water that prevents the formation of permanent bubbles of it, and not a want of attraction.

The roundness of drops of water is not due to the attraction of the whole mass, but merely to the action of the surface, which in all cases of curvature is endowed with an intense contractile power.

This class of investigation also included the study of soap bubbles, and the establishment of the fact of the contractile power of these films. The curvature of the surface of a bubble tends to urge each particle toward the center, with a force inversely as the diameter. Two bubbles being connected, the smaller will collapse by expelling its contents into the larger. By employing frames of wire, soap bubbles were also made to assume various forms, by which capillarity and other phenomena were illustrated. This subject was afterward taken up by Plateau, of Ghent. Another part of the same investigation was the study of the spreading of oil on water, the phenomenon being referred to the fact that the attraction of water for water is greater than that of oil for oil, while the attraction of the molecules of oil for each other is less than the attraction of the same molecules for water; hence the oil spreads over the water. This is shown from the fact that when a rupture is made in a liquid compound, consisting of a stratum of oil resting on water, the rupture takes place in the oil, and not between the oil and water. The very small distance at which the attraction takes place, is exhibited by placing a single drop of oil on a surface of water of a considerable extent, when it will diffuse itself over the whole surface. If, however, a second drop be placed upon the same surface, it will retain its globular form.

XVI. Another contribution to science had reference to the origin of mechanical power and the nature of vital force. Mechanical power is defined to be that which is capable of overcoming resistance; or, in the language of the engineer, that which is employed to do work.

If we examine attentively the condition of the crust of the earth, we find it, as a general rule, in a state of permanent equilibrium. All the substances which constitute the material of the crust, such as acids and bases, with the exception of the indefinitely thin pellicle of vegetable and animal matter which exists at its surface, have all gone into a state of permanent combination, the whole being in the condition of a burnt slag of a furnace, entirely inert, and capable in itself of no change. All the changes which we observe on the surface of the globe may be referred to action from without, from celestial space.

The following is a list which will be found to include all the prime movers used at the present day, either directly or indirectly, in producing molecular changes in matter:

Class I.	Water power. Tide power. Wind power.	Immediately referable to celestial disturbance.
Class II.	Steam and other powers developed by combustion. Animal power.	Immediately referable to what is called vital action.

The forces of gravity, cohesion, electricity, and chemical attraction tend to produce a state of permanent equilibrium on our planet; hence these principles in themselves are not primary, but secondary, agents in producing mechanical effects. As an example, we may take the case of water-power, which is approximately due to the return of the water to a state of stable equilibrium on the surface of the ocean; but the primary cause of the motion is the force which produced the elevation of the liquid in the form of vapor—namely, the radiant heat of the sun. Also, in the phenomena of combustion, the immediate source of the power evolved in the form of heat is the passage from an unstable state into one of stable combination of the carbon and hydrogen of the fuel with oxygen of the atmosphere. But this power may ultimately be resolved into the force which caused the separation of these elements from their previous combination in the state of carbonic acid—namely, the radiant light of the sun. But the mechanical power exerted by animals is due to the passage of organized matter in the stomach from an unstable to a stable equilibrium, or as it were from the combustion of the food. It therefore follows that animal power is referable to the same source as that from the combustion of fuel—namely, developed power of the sun's beams. But according to this view, what is vitality? It is that mysterious principle—not mechanical power—which determines the form and arranges the atoms of organized matter, employing for this purpose the power which is derived from the food.

These propositions were illustrated by different examples. Suppose a vegetable organism impregnated with a germ—a potato, for instance—is planted below the surface of the ground in a damp soil, under a temperature sufficient for vegetation. If we examine it from time to time, we find it sending down rootlets into the earth and stems and leaves upward into the air. After the leaves have been fully expanded we shall find the tuber entirely exhausted, nothing but a skin remaining. The same effect will take place if the potato be placed in a warm cellar. It will continue to grow until all the starch and gluten are exhausted, when it will cease to increase. If, however, we now place it in the light, it will commence to grow again, and increase in size and weight. If we weigh the potato previous to the experiment and the plant after it has ceased to grow in the dark, we shall find that the weight of the latter is a little more than half that of the original tuber. The question then is, what has become of the material which filled the sac of the potato? The answer is, one part has run down into carbonic acid and water, and in this running down has evolved the power to build up the other part into the new plant. After the leaves have been formed and the plant exposed to the light of the sun, the developed power of its rays decomposes the carbonic acid of the atmosphere, and thus furnishes the pabulum and the power necessary to the further development of the organization. The same is the case with wheat and all other grains that are germinated in the earth. Besides the germ of the future plant, there is stored away around the germ the starch and gluten to furnish the power necessary to its development and also the food to build it up until it reaches the surface of the earth and can draw the source of its future growth from the power of the sunbeam. In the case of fungi and other plants that grow in the dark, they derive the power and the pabulum from surrounding vegetable matter in process of decay or in that of evolving power. A similar arrangement is found in regard to animal organization. It is well known that the egg continually diminishes in weight during the process of incubation, and the chick when fully formed weighs scarcely more than one-half the original weight of the egg. What is the

interpretation of this phenomenon? Simply that one part of the contents of the shell has run down into carbonic acid and water, and thus evolved the power necessary to do the work of building up the future animal. In like manner when the tadpole is converted into a frog the animal for a while loses weight. A portion of the organism of its tail has been expended developing the power necessary to the transformation, while another portion has served for the material of the legs.

What, then, is the office of vitality? We say that it is analogous to that of the engineer who directs the power of the steam-engine in the execution of its work. Without this, in the case of the egg, the materials, left to the undirected force of affinity, would end in simply producing chemical compounds—sulphuretted hydrogen, carbonic acid, &c. There is no special analogy between the process of crystallization and that of vital action. In the one case definite mathematical forms are the necessary results, while in the other the results are precisely like those which are produced under the direction of will and intelligence, evincing a design and a purpose, making provision at one stage of the process for results to be attained at a later, and producing organs intended evidently for locomotion and perception. Not only is the result the same as that which is produced by human design, but in all cases the power with which this principle operates is the same as that with which the intelligent engineer produces his result.

This doctrine was first given in a communication to the American Philosophical Society in December, 1844, and more fully developed in a paper published in the Patent Office Report in 1857.

The publication in full of three of the series of investigations herein described was made in the Transactions of the American Philosophical Society. Others were published in Silliman's Journal, and both these are noticed in the Royal Society's Catalogue of Scientific Papers; but the remainder of them were published in the Proceedings of the American Philosophical Society, and are not mentioned in the work just referred to.

In 1846, while still at Princeton, I was requested by members of the Board of Regents of the Smithsonian Institution, which was then just founded, to study the will of Smithson, and to give a plan of organization by which the object of the bequest might be realized. My conclusion was that the intention of the donor was to advance Science by original research and publication; that the establishment was for the benefit of mankind generally, and that all unnecessary expenditures on local objects would be violations of the trust. The plan I proposed for the organization of the Institution was to assist men of science in making original researches, to publish these in a series of volumes, and to give a copy of these to every first-class library on the face of the earth.

I was afterward called to take charge of the Institution and to carry out this plan, which has been the governing policy of the establishment from the beginning to the present time.

One of the first enterprises of the Smithsonian Institution was the establishment of a system of simultaneous meteorological observations over the whole United States, especially for the study of the phenomena of American storms.

For this purpose the assistance of Professor Guyot was obtained, who drew up a series of instructions for the observers, which was printed and distributed in all parts of the country. He also recommended the form of instruments best suited to be used by the observers, and finally calculated, with immense labor, a volume of meteorological and physical tables for reducing and discussing observations. These tables were

published by the Institution, and are now in use in almost every part of the world in which the English language is spoken. The prosecution of the system finally led to the application of the principles established to the predictions of the weather by means of the telegraph.

JOSEPH HENRY.

WASHINGTON, D. C., *December* 4, 1876.

NOTE III.

LIST OF PROFESSOR HENRY'S SCIENTIFIC PAPERS.

[Prepared by Wm. B. Taylor: Published in the Bulletin of the Philosophical Society of Washington, Vol. II.]

1825. On the Production of Cold by the Rarefaction of Air: accompanied with Experiments. (Presented Mar. 2.) Abstract, *Trans. Albany Institute*, vol. i. part ii. p. 36.

1827. On some Modifications of the Electro-magnetic Apparatus. (Read Oct. 10.) *Trans. Albany Inst.* vol. i. pp. 22–24.

1829. Topographical Sketch of the State of New York; designed chiefly to show the General Elevations and Depressions of its Surface. (Read Oct. 28.) *Trans. Albany Inst.* vol. i. pp. 87–112.

1829. First Abstract of Meteorological Records of the State of New York, for 1828. (In conjunction with Dr. T. Romeyn Beck.) *Annual Report of Regents of University*, to the Legislature of New York.—Albany, 1829.

1829. On the Mean Temperature of Twenty-seven different Places in the State of New York, for 1828. (In conjunction with Dr. T. Romeyn Beck.) Brewster's *Edinburgh Jour. Science*, Oct. 1828, vol. i. pp. 249–259.

1830. Second Abstract of Meteorological Records of the State of New York for 1829. (In conjunction with Dr. T. Romeyn Beck.) *Annual Report of Regents of University*, to the Legislature of New York.—Albany, 1830.

1831. On the Application of the Principle of the Galvanic Multiplier to Electro-magnetic Apparatus, and also to the development of great Magnetic power in soft iron, with small Galvanic Elements. Silliman's *American Jour. Science*, Jan. 1831, vol. xix. pp. 400–408.

1831. Tabular Statement of the Latitudes, Longitudes, and Elevations, of 42 Meteorological Stations in New York. *Annual Report Regents of University* to Legislature N. Y. 1831.

1831. Third Abstract of Meteorological Records of State of New York for 1830. (In conjunction with Dr. T. Romeyn Beck.) *Annual Report of Regents of University*, to the Legislature of New York.—Albany, 1831.

1831. An account of a large Electro-magnet, made for the Laboratory of Yale College. (In conjunction with Dr. Ten Eyck.) Silliman's *Am. Jour. Sci.* April, 1831, vol. xx. pp. 201–203.

1831. On a Reciprocating Motion produced by Magnetic attraction and repulsion. Silliman's *Am. Jour. Sci.* July, 1831, vol. xx. pp. 340–343. Sturgeon's *Annals of Electricity*, etc. vol. iii. pp. 430–432.

1832. On a Disturbance of the Earth's Magnetism in connection with the appearance of an Aurora as observed at Albany on the 19th of April, 1831. (Communicated to the Albany Institute, Jan. 26, 1832.) *Report of Regents of University*, to the Legislature of New York.—Albany, 1832. Silliman's *Am. Jour. Sci.* July, 1832, vol. xxii. pp. 143–155.

1832. Fourth Abstract of Meteorological Records of the State of New York for 1831. (In conjunction with Dr. T. Romeyn Beck.) *Annual Report of Regents of University*, to the Legislature of New York.—Albany, 1831.

1832. On the Production of Currents and Sparks of Electricity from Magnetism. Silliman's *Am. Jour. Sci.* July, 1832, vol. xxii. pp. 403–408.

1833. Fifth Abstract of Meteorological Records of the State of New York, for 1832. (In conjunction with Dr. T. Romeyn Beck.) *Annual Report of Regents of University*, to the Legislature of New York.—Albany, 1833.

1835. Contributions to Electricity and Magnetism. No. I. Description of a Galvanic Battery for producing Electricity of different intensities. (Read Jan. 14.) *Transactions Am. Philosoph. Society*, vol. v. pp. 217–222. Sturgeon's *Annals of Electricity*, etc. vol. i. pp. 277–281.

1835. Contributions to Electricity and Magnetism. No. II. On the influence of a Spiral Conductor in increasing the intensity of Electricity from a Galvanic arrangement of a single Pair, etc. (Read Feb. 6.) *Trans. Amer. Phil. Soc.* vol. v. pp. 223–232. Sturgeon's *Annals of Electricity*, etc. vol. i. pp. 282–290. Taylor's *Scientific Memoirs*, vol. i. pp. 540–547.

1835. Facts in reference to the Spark, etc. from a long Conductor uniting the poles of a Galvanic Battery. *Journal of Franklin Institute*, Mar. 1835, vol. xv. pp. 169, 170. *Silliman's Am. Jour. Sci.* July, 1835, vol. xxviii. pp. 327–331.

1837. A Notice of Electrical Researches, particularly in regard to the "lateral discharge." (Read before the British Association at Liverpool, Sept. 1837.) *Report Brit. Assoc.* 1837. Part II. pp. 22–24. Silliman's *Am. Jour. Sci.* April, 1838, vol. xxxiv. pp. 16–19.

1838. A Letter on the production directly from ordinary Electricity of Currents by Induction, analogous to those obtained from Galvanism. (Read to Philosoph. Society, May 4.) *Proceedings Am. Phil. Soc.* vol. i. p. 14.

1838. Contributions to Electricity and Magnetism. No. III. On Electro-dynamic Induction. (Read Nov. 2.) *Trans. Am. Phil. Soc.* vol. vi. pp. 303–338. Silliman's *Am. Jour. Sci.* Jan. 1840, vol. xxxviii. pp. 209–243. Sturgeon's *Annals of Electricity*, etc. vol. iv. pp. 281–310. *L. E. D Phil. Mag.* Mar. 1840, vol. xvi. pp. 200–210: pp. 254–265: pp. 551–562. Becquerel's *Traité expérimental de l'Electricité*, etc. vol. v. pp. 87–107. *Annales de Chimie et de Physique*, Dec. 1841, 3d series: vol. iii. pp. 394–407. Poggendorff's *Annalen der Physik und Chemie.* Supplemental vol. i. (Nach Band li.) 1842, pp. 282–312.

1839. A novel phenomenon of Capillary action: the transmission of Mercury through Lead. (Read Mar. 15.) *Proceedings Am. Phil. Soc.* vol. i. pp. 82, 83. Silliman's *Am. Jour. Sci.* Jan. 1839, vol. xxxviii. pp. 180, 181. *Biblioth. Universelle*, vol. xxix. pp. 175, 176. Liebig's *Annalen der Chemie*, etc. vol. xl. pp. 182, 183.

1839. A Letter on two distinct kinds of dynamic Induction by a Galvanic current. (Read to Phil. Soc. Oct. 18.) *Proceedings Am. Phil. Soc.* vol. i. pp. 134–136.

1839. Observations of Meteors made Nov. 25, 1835, simultaneously at Princeton and at Philadelphia, for determining their difference of Longitude. (In conjunction with Professors A. D. Bache, S. Alexander, and J. P. Espy.) *Proceedings Am. Phil. Soc.* Dec. 21, vol. i. pp. 162, 163. Silliman's *Am. Jour. Sci.* Oct. 1840, vol. xxxix. pp. 372, 373.

1840. Contributions to Electricity and Magnetism. No. IV. On Electro-dynamic Induction. (Read June 19.) *Trans. Am. Phil. Soc.* vol. viii. pp. 1–18. Silliman's *Am. Jour. Sci.* April, 1841, vol. xli. pp. 117–152. Sturgeon's *Annals Electricity*, etc. vol. vii. pp. 21–56. *L. E. D. Phil. Mag.* June, 1841, vol. xviii. pp. 482–514. *Annales de Chim. et Phys.* Dec. 1841, 3d ser. vol. iii. pp. 407–436. Poggendorff's *Annal. der Phys. und Chem.* 1841, vol. liv. pp. 84–97.

1840. Contributions to Electricity and Magnetism. No. IV,—continued. Theoretical Considerations relating to Electro-dynamic Induction. (Read Nov. 20.) *Trans. Am. Phil. Soc.* vol. viii. pp. 18–35.

1840. On the production of a reciprocating motion by the repulsion in the consecutive parts of a conductor through which a galvanic current is passing. (Read Nov. 20.) *Proceedings Am. Phil. Soc.* vol. i. p. 301.

1840. Electricity from heated Water. (Read Dec. 18.) *Proceedings Am. Phil. Soc.* vol. i. pp. 322–324.

1841. Description of a simple and inexpensive form of Heliostat. (Read Sept. 17.) *Proceedings Am. Phil. Soc.* vol. ii. p. 97.

1841. Observations on the effects of a Thunderstorm which visited Princeton on the evening of the 14th of July, 1841. (Read Nov. 5.) *Proceedings Am. Phil. Soc.* vol. ii. pp. 111–116.

1842. Résumé des Recherches faits sur les Courants d'Induction. *Archives de l'Electricité*, 1842, vol. ii. pp. 348–392.

1842. Contributions to Electricity and Magnetism. No. V. On Electro-dynamic Induction: and on the oscillatory discharge. (Read June 17.) *Proceedings Am. Phil. Soc.* vol. ii. pp. 193–196.

1843. On Phosphorogenic Emanation. (Read May 26.) *Proceedings Am. Phil. Soc.* vol. iii. pp. 38–44. Walker's *Electrical Magazine*, 1845, vol. i. pp. 444–450.

1843. On a new Method of determining the Velocity of Projectiles. (Read May 30.) *Proceedings Am. Phil. Soc.* vol. iii. pp. 165–167. Walker's *Electrical Magazine*, 1845, vol. i. pp. 250–352.

1843. Nouvelles Expériences sur l'Induction développée par l'Electricité ordinaire. (Translated.) *Archives de l'Electricité*, 1843, vol. iii. pp. 484–488.

1843. On the application of Melloni's thermo-electric apparatus to Meteorological purposes. (Presented orally Nov. 3.) *Proceedings Am. Phil. Soc.* vol. iv. p. 22.

1843. Theory of the discharge of the Leyden jar. (Presented Nov. 3.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 22, 23.

1844. On the Cohesion of Liquids. (Read April 5.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 56, 57. Silliman's *Am. Jour. Sci.* Oct. 1844, vol. xlviii. pp. 215, 216.

1844. On the Cohesion of Liquids,—continued. (Read May 17.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 84, 85. Silliman's *Am.*

Jour. Sci. Oct. 1844, vol. xlviii. pp. 216, 217. *L. E. D. Phil. Mag.* June, 1845, vol. xxxvi. pp. 541–543.

1844. Syllabus of Lectures on Physics. Princeton, 8vo. 1844. Republished in part in *Smithsonian Report*, 1856, pp. 187–220.

1844. Classification and Sources of Mechanical Power. (Read Dec. 20.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 127–129.

1845. On the Coast Survey. *Princeton Review*, April, 1845, vol. xvii. pp. 321–344.

1845. On the Relative Radiation of Heat by the Solar Spots. (Read June 20.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 173–176. Brief Abstract in *Report Brit. Assoc.* 1845, Part II. p. 6. Walker's *Electrical Magazine*, 1846, vol. ii. pp. 321–324. Froriep's *Neue Notizen*, etc., No. 826, 1846, vol. xxxviii. col. 179–182. Poggendorff's *Annalen der Physik und Chemie*, 1846, vol. lxviii. pp. 102–104.

1845. On the Capillarity of Metals. (Read June 20.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 176–178. Froriep's *Neue Notizen*, etc., No. 825, 1846, vol. xxxviii. col. 168–169. Poggendorff's *Annalen der Physik und Chemie.* 2d supplemental vol. (Nach Band lxxii.) 1848, pp. 358–361.

1845. On the Protection of Buildings from Lightning. (Read June 20.) *Proceedings Am. Phil. Soc.* vol. iv. p. 179. Silliman's *Am. Jour. Sci.* 1846, vol. ii. pp. 405, 406. Walker's *Electrical Magazine*, 1846, vol. ii. pp. 324–326. Froriep's *Neue Notizen*, etc., No. 823, 1846, vol. xxxviii. col. 133, 134.

1845. An account of peculiar effects on a house struck by Lightning. (Read June 20.) *Proceedings Am. Phil. Soc.* vol. iv. p. 180.

1845. On Color Blindness. *Princeton Review*, July, 1845, vol. xvii. pp. 483–489.

1845. On the discharge of Electricity through a long wire, etc. (Read Nov. 7.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 208, 209.

1846. Repetition of Faraday's Experiment on the Polarization of Liquids under the influence of a galvanic current. (Read Jan. 16.) *Proceedings. Am. Phil. Soc.* vol. iv. pp. 229, 230.

1846. Extrait d'une Lettre à M. de la Rive, sur les Télégraphes Electriques dans les Etats-Unis de l'Amérique. *Biblioth. Universelle. Archives*, 1846, vol. ii. p. 178.

1846. Report on the action of Electricity on the Telegraph Wires: and Telegraph-poles struck by Lightning. (Read June 19.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 260–268. Silliman's *Am. Jour. Sci.* 1847, vol. iii. pp. 25–32. *L. E. D. Phil. Mag.* 1847, vol. xxx. pp. 186–194. *Agricultural Report*, Commr. Pats. 1859, pp. 509–511.

1846. On the ball supported by a water jet: also experiments in regard to the "interference" of heat. (Read Oct. 16.) *Proceedings Am. Phil. Soc.* vol. iv. p. 285.

1846. On the corpuscular hypothesis of the constitution of Matter. (Read Nov. 6.) *Proceedings Am. Phil. Soc.* vol. iv. pp. 287–290.

1846. On the Height of Auroræ. (Read Dec. 3.) *Proceedings Am. Phil. Soc.* vol. iv. p. 370.

1847. Programme of Organization of the Smithsonian Institution. (Presented to the Board of Regents, Dec. 8, 1847.) *Smithsonian Report*, 1847, pp. 120–132.

1847. Article on "Magnetism" for the Encyclopædia Americana. *Encycl. Amer.* 1847, vol. xiv. pp. 412–426.

1848. On Heat.—A Thermal Telescope. Silliman's *Am. Jour. Sci.* Jan. 1848, vol. v. pp. 113, 114.

1848. Explanations and Illustrations of the Plan of the Smithsonian Institution. Silliman's *Am. Jour. Sci.* Nov. 1848, vol. vi. pp. 305–317.

1849. On the Radiation of Heat. (Read Oct. 19.) *Proceedings Am. Phil. Soc.* vol. v. p. 108.

1850. Analysis of the dynamic phenomena of the Leyden jar. *Proceedings Amer. Association*, Aug. 1850, pp. 377, 378.

1851. On the Limit of Perceptibility of a direct and reflected Sound. *Proceedings Amer. Association*, May, 1851, pp. 42, 43.

1851. On the Theory of the so-called Imponderables. *Proceedings Amer. Association*, Aug. 1851, pp. 84–91.

1853. Address before the Metropolitan Mechanics' Institute, Washington. (Delivered March 19.) 8vo. Washington, 1853, 19 pp.

1854. Meteorological Tables of mean diurnal variations, etc. prepared as an Appendix to Mr. Russell's Lectures on Meteorology. *Smithsonian Report* for 1854, pp. 215–223.

1854. Thoughts on Education; an Introductory Discourse before the Association for Advancement of Education. (Delivered Dec. 28.) *Proceedings Assoc. Adv. Education*, 4th Session, 1854, pp. 17–31.

1855. On the mode of Testing Building Materials, etc. *Proceedings Am. Assoc.* Aug. 1855, pp. 102–112. Silliman's *Am. Jour. Sci.* July, 1856, vol. xxii. pp. 30–38; *Smithsonian Report*, 1856, pp. 303–310.

1855. On the effect of mingling Radiating Substances with Combustible Materials: (or incombustible bodies with fuel). *Proceedings Am. Assoc.* Aug. 1855, pp. 112–116.

1855. Account of Experiments on the alleged spontaneous separation of Alcohol and Water. *Proceed. Am. Assoc.* Aug. 1855, pp. 140–144.

1855. On the Induction of Electrical Currents. (Read Sept. 11.) *Proceedings Am. Academy of Arts*, etc. vol. iii. p. 198.

1855. Note on the Gyroscope. Appendix to Lecture by Prof. E. S. Snell. *Smithsonian Report*, 1855, p. 190.

1855. Remarks on Rain-fall at varying elevations. *Smithsonian Report*, 1855, pp. 213, 214.

1855. Directions for Meteorological Observations. (In conjunction with Prof. A. Guyot.) *Smithsonian Report*, 1855, pp. 215–244.

1855. Circular of Inquiries relative to Earthquakes. *Smithsonian Report*, 1855, p. 245.

1855. Instructions for Observations of the Aurora. *Smithsonian Report*, 1855, pp. 247–250.

1855. On Green's Standard Barometer for the Smithsonian Institution. *Smithsonian Report*, 1855, pp. 251–258.

1855. Circular of Instructions on Registering the periodical phenomena of animal and vegetable life. *Smithsonian Report*, 1855, pp. 259–263.

1855. Meteorology in its connection with Agriculture, Part I. *Agricultural Report* of Commr. Pats. 1855, pp. 357–394.

1856. On Acoustics applied to Public Buildings. *Proceedings Am. Assoc.* Aug. 1856, pp. 119–135. *Smithsonian Report*, 1856, pp. 221–234. *Canadian Journal*, 1857, vol. ii. pp. 130–140.

1856. Account of a large Sulphuric-acid Barometer in the Hall of the Smithsonian Institution Building. *Proceedings Am. Assoc.* Aug. 1856, pp. 135–138.

1856. Meteorology in its connection with Agriculture, Part II. General Atmospheric Conditions. *Agricultural Report* of Commr. Pats. 1856, pp. 455–492.

1857. Communication to the Board of Regents of the Smithsonian Institution, relative to a publication by Prof. Morse. *Smithsonian Report*, 1857, pp. 85–88.

1857. Statement in relation to the history of the Electro-magnetic Telegraph. *Smithsonian Report*, 1857, pp. 99–106.

1857. Meteorology in its connection with Agriculture, Part III. Terrestrial Physics, and Temperature. *Agricultural Report* of Commr. Pats. 1857, pp. 419–506.

1858. Meteorology in its connection with Agriculture, Part IV. Atmospheric Vapor, and Currents. *Agricultural Report* of Commr. Pats. 1858, pp. 429–493.

1859. On Meteorology. *Canadian Naturalist and Geologist*, Aug. 1859, vol. iv. pp. 289–291.

1859. Application of the Telegraph to the Prediction of Changes of the Weather. (Read Aug. 9.) *Proceedings Am. Academy of Arts*, etc. vol. iv. pp. 271–275.

1859. Meteorology in its connection with Agriculture, Part V. Atmospheric Electricity. *Agricultural Report* of Commr. Pats. 1859, pp. 461–509.

1859. On the Protection of Buildings from the effects of Lightning. *Agricult. Report*, Com. Pat. 1859, pp. 511–524.

1860. On the Conservation of Force. Silliman's *Am. Jour. Sci.* July, 1860, vol. xxx. pp. 32–41.

1860. Circular to Officers of Hudson's Bay Company (April 20). *Smithsonian Miscell. Collections*, No. 137, vol. viii. pp. 1–6.

1860. Description of Smithsonian Anemometer. *Smithsonian Report*, 1860, pp. 414–416.

1861. Letter on Aeronautics to Mr. T. S. C. Lowe. (March 11.) *Smithsonian Report*, 1860, pp. 118, 119.

1861. Article on "Magnetism" for the American Encyclopædia. Edited by Ripley and Dana. *Am. Encycl.* 1861, vol. xi. pp. 61–63.

1861. Article on "Meteorology" for the American Encyclopædia. Edited by Ripley and Dana. *Am. Encycl.* 1861, vol. xi. pp. 414–420.

1862. Report of the Light House Board on the proposed Transfer of the Lights to the Navy Department. Exec. Docts. 37th Cong. 2d Sess. Senate, Mis. Doc. No. 61, pp. 2–18.

1863. Introduction to Memoir by Prof. J. Plateau. On the Figures of Equilibrium of a Liquid Mass, etc. *Smithsonian Report*, 1863, pp. 207, 208.

1864. On Materials for Combustion in Lamps of Light-Houses. (Read Jan. 12, before the National Academy of Sciences.) [Not published in Proceedings.]

1865. Report relative to the Fire at the Smithsonian Institution, occurring Jan. 24th, 1865. (In conjunction with Mayor Richard Wallach.) Presented to the Regents February, 1865. *Smithsonian Report*, 1864, pp. 117–120.

1865. Queries relative to Tornadoes: directions to observers. *Smithsonian Miscell. Collections*, No. 190, vol. x. pp. 1–4.

1865. Remarks on the Meteorology of the United States. *Smithsonian Report*, 1865, pp. 50–59.

1866. Report on the Warming and Ventilating of the U. S. Capitol. (May 4.) *Exec. Doc.* No. 100. H. of Rep. 39th Cong. 1st Sess. pp. 4–6.

1866. Report of Building Committee on Repairs to Sm. Institution from Fire. (In conjunction with Genl. Richard Delafield, and Mayor Richard Wallach.) Presented to Regents April 28. *Smithsonian Report*, 1865, pp. 111–114.

1866. On the aboriginal Migration of the American races. Appendix to paper by F. Von Hellwald. *Smithsonian Report*, 1866, pp. 344, 345.

1866. Remarks on Vitality. *Smithsonian Report*, 1866, pp. 386–388.

1866. Meteorological Notes. To Correspondents. *Smithsonian Report*, 1866, pp. 403–412.

1867. Circular relating to Collections in Archæology and Ethnology. (Jan. 15.) *Smithsonian Miscell. Collections*, No. 205, vol. viii. pp. 1, 2.

1867. Circular relative to Exchanges. (May 16.) *Smithsonian Report*, 1867, p. 71.

1867. Suggestions relative to Objects of Scientific Investigation in Russian America. (May 27.) *Smithsonian Miscell. Collections*, No. 207, vol. viii. pp. 1–7.

1867. Notes on Atmospheric Electricity. To Correspondents. *Smithsonian Report*, 1867, pp. 320–323.

1868. Appendix to a Notice of Schœnbein. *Smithsonian Report*, 1868, pp. 189–192.

1869. Memoir of Alexander Dallas Bache. (Read April 16.) *Biographical Memoirs of Nat. Acad. Sci.* vol. i. pp. 181–212. *Smithsonian Report*, 1870, pp. 91–116.

1870. Letter. On a Physical Observatory. (Dec. 29.) *Smithsonian Report*, 1870, pp. 141–144.

1871. Observations on the Rain-fall of the United States. *Proceedings California Academy of Sciences*, vol. iv, p. 185.

1871. Instructions for Observations of Thunder-Storms. *Smithsonian Miscell. Collections*, No. 235, vol. x. p. 1.

1871. Circular relative to Heights. For a topographic chart of N. America. *Smithsonian Miscell. Collections*, No. 236, vol. x. p. 1.

1871. Directions for constructing Lightning-Rods. *Smithsonian Miscell. Collections*, No. 237, vol. x. pp. 1–3. Silliman's *Am. Jour. Sci.* Nov. 1871, vol. ii. pp. 344–346.

1871. Letter to Capt. C. F. Hall, in regard to the Scientific Operations of the Expedition toward the North Pole. (June 9.) *Smithsonian Report*, 1871, pp. 364–366.

1871. Suggestions as to Meteorological Observations; during the Expedition toward the North Pole. *Smithsonian Report*, 1871, pp. 372–379.

1871. Meteorological Notes and Remarks. *Smithsonian Report*, 1871, pp. 452, 455, 456, 459, 461.

1871. Effect of the Moon on the Weather. *Smithsonian Report*, 1871, pp. 460, 461.

1871. Anniversary Address as President of the Philosophical Society of Washington. (Delivered Nov. 18.) *Bulletin Phil. Soc. Washington*, vol. i. pp. 5–14.

1872. Remarks on Cosmical Theories of Electricity and Magnetism: an Appendix to a Memoir by Prof. G. B. Donati. *Smithsonian Report*, 1872, pp. 307–309.

1872. On certain Abnormal Phenomena of Sound, in connection with Fog-signals. (Read Dec. 11.) *Bulletin Phil. Soc. Washington*, vol. i. p. 65, and Appendix ix. 8 pp.

1873. Letter to John C. Green, Esq., of New York, on his establishment

of the "Henry Chair of Physics" in the College of New Jersey. *Washington Daily Chronicle*, Mar. 21, 1873.

1873. On Telegraphic Announcements of Astronomical Discoveries. (May.) *Smithsonian Miscell. Collections*, No. 263, vol. xii. pp. 1–4.

1873. Remarks on the Light-House Service. *Report of Light-House Board*, 1873, pp. 3–7.

1874. Report of Investigations relative to Fog-Signals, and certain abnormal phenomena of Sound. *Report of Light-House Board*, 1874. Appendix, pp. 83–117.

1874. Memoir of Joseph Saxton. (Read Oct. 4.) *Biographical Memoirs of Nat. Acad. Sci.* vol. i. pp. 287–316.

1874. Remarks on Recent Earthquakes in North Carolina. *Smithsonian Report*, 1874, pp. 259, 260.

1875. Remarks on the Light-House Service. *Report of Light-House Board*, 1875, pp. 5–8.

1875. An account of investigations relative to Illuminating Materials. *Report of Light-House Board*, 1875. Appendix, pp. 86–103.

1875. Investigations relative to Sound. *Report of Light-House Board*, 1875. Appendix, pp. 104–126.

1875. On the Organization of Local Scientific Societies. *Smithsonian Report*, 1875, pp. 217–219.

1876. Article on "Fog," for Johnson's Universal Cyclopædia. Edited by Dr. Barnard. *J. Univ. Cycl.* vol. ii. pp. 187, 188.

1876. Article on "Fog-Signals," for Johnson's Universal Cyclopædia. Edited by Dr. Barnard. *J. Univ. Cycl.* vol ii. pp. 188–190.

1876. Article on "Hygrometry," for Johnson's Universal Cyclopædia. Edited by Dr. Barnard. *J. Univ. Cycl.* vol. ii. pp. 1072–1074.

1876. Letter to Rev. S. B. Dod; On researches at Princeton. (Dated Dec. 4.) *Princeton Memorial*, May 19, 1878, 8vo., N. Y., pp. 51–70.

1877. Article on "Lightning," for Johnson's Universal Cyclopædia. Edited by Dr. Barnard. *J. Univ. Cycl.* vol. iii. pp. 32–36.

1877. Article on "Lightning-Rods," for Johnson's Universal Cyclopædia. Edited by Dr. Barnard. *J. Univ. Cycl.* vol. iii. pp. 36, 37.

1877. Remarks on the Light-House Service. *Report of Light-House Board*, 1877, pp. 3–7.

1877. Report of Operations relative to Fog-Signals. *Report of Light-House Board*, 1877. Appendix, pp. 61–72.

1877. Address before the Philosophical Society of Washington. *Bulletin Phil. Soc. Washington*, vol. ii. pp. 162–174.

1878. On Thunder Storms. (Letter Oct. 13.) *Journal Am. Electrical Society*, 1878, vol. ii. pp. 37–43.

1878. Letter to Joseph Patterson, Esq., of Philadelphia, on the "Joseph Henry Fund." (Dated Jan. 10.) *Public Ledger and Transcript*, May 14, 1878. *The Press*, of Philadelphia, May 14, 1878.

1878. Report on the Ventilation of the Hall of the House of Representatives. (Jan. 26.) 45th Cong. 2d Sess. H. R. Report, No. 119, pp. 1–6.

1878. Report on the Use of the Polariscope in Saccharimetry. (Feb. 5.) Mis. Doc. 45th Cong. 2d Sess. H. R.

1878. Opening Address before National Academy of Sciences. (Read April 16.) *Proceedings Nat. Acad. Sci.* vol. i. part 2, pp. 127, 128.

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GENERAL APPENDIX

TO THE

SMITHSONIAN REPORT FOR 1878.

The object of this appendix is to illustrate the operations of the Institution by reports of lectures and extracts from correspondence, as well as to furnish information of a character suited especially to the observers and other persons interested in the promotion of knowledge.

CONDORCET: A BIOGRAPHY.

By M. Arago.

[Translated for the Smithsonian Institution by M. A. Henry.]

INTRODUCTION.

During the latter years of his life, George Cuvier consented to spare a few moments from his immortal researches to make some notes for the benefit of his future biographers. One of these notes commences thus: "I have written so many eulogies, that it is not presumptious to suppose that some one will write mine." This remark of the illustrious naturalist has reminded me that the last secretary of the old Academy of Sciences, himself the author of fifty-four biographies of academicians equally remarkable for their conception and their expression, has not yet received in this assembly the tribute which on many accounts is justly his due. The fact that we have owed this debt to his memory half a century is only a more powerful reason that it should be discharged without further delay. Our eulogies, as our memoirs, should have truth for their foundation and their object. But truth in regard to public men is difficult to attain, particularly when their lives have been passed in the midst of political storms. I therefore earnestly appeal to the few contemporaries of Condorcet whom death has spared, for correction of any error I may have made in spite of my careful efforts.

It has perhaps been observed that I have called my article a *biography* and not as usual an *historical eulogy*. It is in fact a detailed biography I have the honor to present to the Academy. Without desiring to establish a precedent for future secretaries, I will explain how in this instance the old form did not fulfil the end I desired.

Condorcet was no ordinary academician devoted alone to the labors of the closet: a speculative philosopher, and a citizen of unbiased judgment,—his life, his public and private conduct, and his works, were influential in literary, economical, and political associations. No one suffered more from the instability of public favor, jealousy, and fanaticism,—those three terrible scourges of reputation. In sketching a portrait, which it is my duty to render as faithful as possible, I cannot pretend to claim belief on mere assertion. It is not enough that for every characteristic feature I have endeavored with the greatest care to assure my own mind that my impressions are correct; I must enable the public to intelligently decide between the prevailing judgment and my own; it is necessary, therefore, to carefully examine and combat

the false views of those who, in my estimation, have never truly comprehended the majestic aspect presented to his generation by the great Condorcet.

If I venture to hope that I have found truth where others have fallen into error, it is because I have had access to private sources of information. The distinguished daughter of our former secretary, and her illustrious husband, General O'Connor, have placed their rich archives at my disposal, with a kindness, unreserve, and liberality for which I cannot sufficiently thank them. Many manuscripts of Condorcet finished or incomplete, his letters to Turgot, answers from the lord lieutenant of Limoges, the comptroller-general of finance, fifty two unpublished letters of Voltaire, the correspondence of Lagrange with the secretary of the Academy of Sciences and with d'Alembert, letters of Frederick the Great, of Franklin, of Mademoiselle de l'Espinasse, of Borda, of Monge, &c.,—such are the treasures I received from the honorable family of Condorcet. This is the material which has led me to clear and precise ideas of the part taken by our confrère in the political, social, and intellectual movement of the second half of the eighteenth century.

I have a fear that I have not sufficiently avoided a temptation resulting from the kindness of General and Mrs. O'Connor. In going over the manuscript confided to me, my mind was involuntarily impressed with the apprehension of the thousand accidents which might happen to those precious pages, and the result has been an uncommon number of quotations, and therefore an expansion of points which perhaps might better have been only alluded to. I am aware of the inconvenience of such elaboration, but consider as sufficient compensation that I have perhaps rescued from oblivion facts, opinions, and literary judgments of great value; that I have made to speak in my place many eminent personages of the last century.

One word as to the unusual length of this article. I am well aware of the demands it must make upon the patient attention of my hearers, and the great desirability of retrenchment even after the numerous omissions which had become necessary by the exigencies of a public reading, but I consider my mission unusual, and more than ordinarily solemn; in fact I am about to undertake the rehabilitation of a colleague, and that in every point of view, scientific, literary, philosophical, and political. Any feeling of self-love that might interfere with this end would manifestly be unworthy of the assembly I address as well as of myself.

Infancy and youth of Condorcet—His studies, his character, his mathematical labors.

Jean Antoine Nicolas Caritat de Condorcet, formerly perpetual secretary of the Academy of Sciences, was born on the 17th of September, 1743, in Picardy, in the small village of Ribemont, which had already given to the Academy the engineer Blondel, celebrated by the construction of

the gate of Saint Denis. The father of Condorcet, M. Caritat, a captain of cavalry, originally the Dauphin's, was the younger brother of the prelate whom we see successively from 1741 bishop of Gap, of Auxerre, and of Lisieux. He was also related to the cardinal of Bernis and the famous archbishop of Vienna, M. d'Yse of Saléon, who while bishop of Rodez made himself so prominent in the council of Embrun by his warm support of the Jesuits.

Condorcet had hardly attained his fourth year when he lost his father. The widow of Captain Caritat was very devotional in her tendencies. As, in her opinion, an infallible means of protecting her only son from the dangers of youth, she dedicated him to the Virgin and to the wearing of white garments. Condorcet accordingly wore for eight years the costume of a girl. This singular circumstance, as an effectual interdiction of all gymnastic exercises, retarded greatly the development of his physical powers. It also prevented him from entering the public schools, since a boy in petticoats could not fail to be an object of derision.

When he had attained his eleventh year, his uncle placed him under the care of one of the members of that celebrated Society of Jesus, around which began already to gather the political storm.

Not to trespass upon your time, permit me here a reflection. Madame Caritat de Condorcet, in the excess of her maternal love, subjected the childhood of the future secretary of the Academy to practices tending in more than one respect to superstition. The young Condorcet, as soon as he opened his eyes, was surrounded by a family composed of the highest dignitaries of the church and military officers, whose ideas were without exception aristocratic; his first guides, his first instructors, were Jesuits. Behold the result of so unusual a concourse of circumstances. In politics, a complete rejection of all idea of hereditary prerogative; in religion, scepticism carried to its utmost limits. This reflection confirmed by many observations of a similar character history can furnish, should it not calm somewhat the ardor with which political and religious parties, setting aside the rights of families, dispute by turns the monopoly of public instruction. Such a monopoly is dangerous only in a country where thought is chained; with the liberty of the press, reason, whatever may be done, will finally assert itself.

In the month of August, Condorcet, then thirteen years of age, carried off the second prize in the institution the Jesuits had established at Reims. In 1758 he commenced at Paris his mathematical studies, at the College of Navarre. His success was brilliant and rapid, for at the end of ten months he maintained a very difficult analytical thesis with so much distinction, that Clairaut, d'Alembert, and Fontaine, who examined him, saluted him as a future member of the Academy.

Such a horoscope from persons so eminent decided the future of the young mathematician. In spite of the resistance he foresaw on the part of his family, he resolved to devote himself to the pursuit of science,

and established himself at Paris for the purpose with his old master, M. Giraud de Kéroudon.

When Condorcet left college he was already a profound thinker. I find in a letter of 1775, addressed to Turgot, and entitled *My confession of faith*, that at the age of seventeen years the young scholar had seriously reflected upon the moral ideas of justice and virtue, and upon the question whether (leaving aside other considerations) it was to man's interest to be just and virtuous. I give his solution of the question, although not sure of its originality with him. I am quite convinced, however, of the novelty of the extreme resolution to which it led him.

"A sentient being suffers from the evil which another sentient being experiences. In society, an unjust or criminal action cannot fail to injure some one. The author of such an action has, then, the consciousness of having caused suffering to one of his own kind. If the sensibility with which nature has endowed him remains intact, he must therefore suffer himself. In order, then, not to destroy his natural sensibility he must, in self-interest, strengthen his ideas of virtue and justice."

This conclusion followed naturally from the premises. It led the young Condorcet to renounce entirely the chase, and prevented him from killing even insects, provided that they did not harm him.

There were very few subjects in regard to which Condorcet had, even in early youth, vague and unformed opinions, and there is a beautiful harmony between the various periods of his laborious and agitated career. We see him, while still a youth, place kindness towards animals among the most efficacious means for preserving natural sensibility,—according to him, the principal source of all virtue. This idea controlled him throughout life. Even just before his death, in the admirable tract called *Advice of an outlaw to his daughter*, he writes these touching exhortations:

"My dear daughter, preserve in all its purity, all its force, the feeling which leads us to share the sorrow of every sentient being. Do not confine your sensibilities to the sufferings of the human race, but let your humanity extend even to animals; render those happy which belong to you; do not disdain to consider their well-being; be not insensible to their naive and sincere gratitude; cause them no useless pain. * * * The want of foresight in animals is the only excuse for that barbarous law which impels them to uselessly destroy each other."

I must seize the first opportunity which offers to show you Condorcet resolutely following these principles. Such as he was in morals we find him later in politics.

The first fruit of the meditations to which Condorcet devoted himself with M. Geraud de Kéroudon was a work entitled *Essay upon the integral calculus*. The author was only twenty-two when he presented it to the Academy. Allow me to preface with a few general reflections what I have to say of this treatise and of other mathematical works of Condorcet.

We can hardly mention in the vast domain of science more than eight or ten important discoveries which have not required the successive efforts of several generations of savans. Unhappily, inventors, from a mistaken feeling of self-love, are not ready to acknowledge to the historians of science the sources from which they have borrowed; they desire more to astonish than to instruct. They do not see it is far better to confess loyally their indebtedness than to incur the suspicion of bad faith.

In the sciences of observation every course of stones composing a complete edifice is more or less apparent. Books, academic collections, tell when and by whom these courses have been laid. The public may count the stages which must be surmounted by him to whom is reserved the happiness of laying the cap-stone. Each has his appropriate share of glory in the work of centuries.

Such is not the case with pure mathematics. The filiation of methods often escapes the most practised eye; at each step we find processes, theories without apparent connection with any which precede. Certain geometers move majestically in the upper regions of space, while it is not easy to say who prepared the road for their ascent. We may add that this road is usually established upon a scaffolding taken care of by no one when the road is completed. To collect scattered *débris* is a task unpleasant, ungrateful, and without glory, and, for this triple reason, is seldom undertaken.

The savans who devote themselves to pure mathematics without attaining the first rank must resign themselves to all these disadvantages. I have not yet mentioned the most important; it results from the necessity the historian of mathematics experiences of divesting his mind entirely of the light of his own century in judging of the works of former times. To this may be principally attributed the fact that Condorcet has never taken his true rank among geometers, and it is also on account of this difficulty that I have shrunk from the obligation of describing in a few lines the numerous mathematical works of our former secretary. Happily, as I have already said, I have in my hands unpublished articles of Lagrange, of d'Alembert, in which the memoirs of Condorcet are noticed at the time of their publication. Condorcet was thus judged by men of the utmost competence; an advantage by no means always secured to mathematical workers in the appreciation they receive from their contemporaries.

The first work of Condorcet, his *Integral calculus*, was examined by an academical committee, in May, 1765. The report of it, presented by d'Alembert, ends thus: "This work indicates great talent and deserves the approbation of the Academy."

Certain superficial critics, who scarcely looked at the work of Condorcet, spoke of it with ridicule and contempt, undoubtedly considering that the reporter of the academical committee treated it with culpable indulgence; and they seemed to have referred the matter to Lagrange, for this great geometer wrote to d'Alembert the 6th day of July, 1765: "The

Integral calculus of Condorcet appears to me well worthy of the praises with which you have honored it."

But setting these authorities aside, it is none the less established that this work contains the first serious well considered discussions of the conditions of integration of the ordinary differential equations of all orders, as well relatively to the integral of an immediately inferior order, as to the definitive integral. In it we also find the germs of several important works, since completed, on equations with finite differences.

The volume of the Academy of Sciences for 1772 contains the memoir in which the inventive spirit of Condorcet is most brilliantly manifested. The blind or systematic detractors of the mathematical ability of our former secretary are again controverted by the following verdict of Lagrange upon this production:

"The memoir is filled with great and fruitful ideas sufficient to have supplied the material for several works. The last article has especially impressed me by its elegance and utility. Recurrent series have so frequently been treated before, that the subject might have been considered exhausted. In this article, however, is a new application of these series, more important, in my opinion, than any which had been made before. It opens to us, so to say, a new field for the perfection of the Integral calculus."

Without leaving the field of pure mathematics, I might find in the academic collections of Paris, Berlin, Bologna, St. Petersburg, works bearing upon the most difficult questions of the science which would equally attest the ability of our former secretary, but I must hasten to notice some applications of analysis which did him no less honor. To do justice to the subject in any reasonable time I cannot proceed by order of date.

When we reflect upon the difficulties of all kinds astronomers have to overcome in order to determine with precision the orbits of the planets; when we consider, further, that it has been possible to harmonize the positions taken by the planets at the apogee, at the perigee, and all the intermediate points, only because they are constantly observable, we can hardly dare to conceive the hope of ever tracing in space the course of most of the comets, those vagrant stars which show themselves for a few days, only to be lost for centuries.

A very simple analytical calculus dissipates this impression. It shows that, speaking theoretically, three observations are more than sufficient to determine a comet's orbit, supposed to be parabolic, but the elements of this orbit are found to be so entangled in the equations that it appears difficult to free them without calculations of inconvenient length.

The problem thus regarded was not really solved, even after Newton, Fontaine, Euler, &c., had made it the subject of assiduous study. When the Academy of Berlin proposed it as a prize subject, the astronomers, instead of employing the methods of computation of these great geometers, still pursued the graphic systems, in which parabolas of card-board

of various parameters are used. The aim of the Academy was clearly expressed—to have the processes employed, at once direct and simple. The award of the prize was to have been made in 1774, but it was deferred. In 1778 Condorcet shared it with M. Tempelhoff. "Your beautiful essay," wrote Lagrange to our confrère (June 8, 1778), "would have received the entire prize if the application of your theory had been made to any particular comet. This condition was in the programme." The condition was certainly there, but Condorcet had, as he himself acknowledges, an extreme repugnance "for calculations which tax without pleasing the attention." Of course it will be understood that numerical calculations are meant.

Among the great mathematical discoveries the world owes to France is a branch of calculus still very little appreciated, notwithstanding the services it has already rendered and those it still promises. This is the calculus of probabilities.

I do not hesitate to claim this discovery of the calculus of probabilities for our country, notwithstanding the efforts which have been made to deprive her of the credit. To dignify as inventors of this calculus the authors of some numerical remarks, without precision upon the various ways of computing a certain sum of points, in the simultaneous throw of three dice, would be a baseless pretension, which even national prejudice could hardly excuse.

Among the eminent services this calculus has rendered to mankind we should mention in the first line the abolition of the lottery and several other games of chance, which were as traps set for cupidity, credulity, and ignorance. Thanks to the evident and simple principles upon which the new analysis is founded, it is no longer possible to disguise the frauds in which these financial combinations were formerly entrenched: discounts, annuities, tontines, insurances of all kinds, have lost their character of mystery and obscurity.

On this ground the application of probabilities has been admitted without much resistance. But when Condorcet, after some essays of Nicolas Bernoulli, made incursion, by means of the new calculus, into the domain of jurisprudence and of moral and political science, an opposition almost general warned him that he could not take possession of this field without a severe contest. To tell the truth, the contest still continues. In order to end it, the geometers, on the one hand, must consent to put the principles of probabilities in clear, precise terms, as free as possible from technical expressions; while, on the other hand (and this is much more difficult), the public must be led to recognize, that appreciation of certain very complex matters cannot be attained at a glance; that it is impossible to speak pertinently of figures without mastering first at least the principles of enumeration; finally that there exist truths, legitimate connections, outside of those, the rudiments of which may have been acquired in youth, or by the reading of classical works. To comprehend that civil and criminal tribunals should be con-

stituted so that the innocent may run very little risk of condemnation; in order also to comprehend that the chances of an unjust condemnation will be as much lessened as the judgment is rendered by the greater majority, the simple natural light of the most ordinary sentiments of humanity is all that is necessary. The problem becomes much more complicated when the question is to reconcile the proper guaranty of justice to the innocent with the need of society that the guilty shall not escape; simple reason here gives only vague results, to these calculation alone can give precision.

Let me repeat, that in judicial decisions there are certain phases, certain points of view, where resort may be had to calculation. By carrying into this labyrinth the torch of mathematical analysis, Condorcet not only proved his own courage, but opened an entirely new path. This, if pursued by geometers with a firm but cautious step, should lead to the discovery, in the social, judicial, and political organization of modern societies, of anomalies hitherto unsuspected.

It is quite evident that in its incursions into the domain of jurisprudence, the calculus of probabilities has for its object solely the numerical comparison of the decisions obtained with such or such a majority; to find the relative value of such or such number of witnesses. I may then in terms of severe reproof direct the attention of the public to the passages La Harpe, in his *Philosophie du XVIII Siécle*, has devoted to these applications of mathematics. It will be seen there, I dare say, with astonishment that the writer accuses our colleague of wishing to do away with testimony, and even written proof; of pretending to replace these advantageously by analytical formulæ. Instead of desiring to refute expressions so far from academical as "this is a supremely ridiculous use of science," it is "an extravagant conquest of the revolutionary philosophy," "this shows what insanity mathematics may produce," one regrets to see a man of real talent fallen into such incredible errors. As to the rest, it is a new proof that no one, not even an academician, can safely speak of that which he has not studied.

I must confess that the mathematical writings of Condorcet lack the elegant clearness which distinguish in so high a degree the memoirs of Euler and of Lagrange. D'Alembert, who was himself not irreproachable in this respect, endeavored, but with no great success, to induce our former secretary to take more pains. In March, 1772, he wrote to Lagrange: "I wish much that our friend Condorcet, who has so much sagacity, and such genius, had a better manner of expression, but it seems to be the nature of his mind to work in this way." This excuse for him has more foundation than might readily be accepted. Euler, d'Alembert, Lagrange, with an equal talent for mathematics, had each entirely different modes of working. Euler calculated without apparent effort, as men breathe, as the birds fly. In a letter I have under my eyes, dated 1769, d'Alembert thus speaks of himself to Lagrange: "It is not in my nature to occupy myself with one thing

long at a time. I leave a subject and resume it again as often as the humor takes me, without discouragement, and ordinarily this intermittent perseverance is successful." A third way in which genius works seems to be indicated by this passage, which I copy from a manuscript note from the author of the *Mécanique analytique:* "My occupations are reduced to studying geometry tranquilly and in silence. As I am not pressed and work more for my own pleasure than from duty, like the lord of a chateau who builds, tears down, and rebuilds again, I make, unmake, and remake until I am tolerably content with the results, which, however, rarely happens." It is well, perhaps, that variety and individuality exist in mathematical researches, as in everything else; that ways the most diverse may equally lead men of ability to such discoveries as the mutual attraction of celestial bodies, the cause of the change in the obliquity of the ecliptic, the cause of the precession of the equinoxes, and that of the libration of the moon.

It may be asked with very natural surprise how Condorcet could renounce so easily the success a scientific career promised him in order to throw himself into the discussions of a subject often very problematical—social economy, and into the heated arena of politics. If this was a fault, many others also were equally culpable. Moreover, here is the palliation: Early convinced that the human race is indefinitely perfectible, Condorcet (I copy) regarded its improvement "as one of the pleasantest occupations, one of the first duties of the man who has strengthened his reason by study and meditation." He expressed the same thought in other words when, in a letter to Voltaire, he speaks with regret of returning to geometry: "It seems cold to work only for vainglory, when one desires to be working for the public good." I do not admit the distinction; the vainglory Condorcet speaks of was more directly conducive to the benefit of humanity than the researches, economical and philosophical, which our confrère undertook with so much zest in the social community. The good done by science has roots deeper and more extended than those from any other source. It is not subject to the fluctuations, the sudden caprices, the retrograde movements which so often produce perturbations in society. The torch of science dissipates a hundred old and debasing prejudices, inveterate maladies of the moral and intellectual world. If Condorcet was inclined to insinuate that scientific discoveries have no direct or immediate influence upon the body politic, I will not revert to such well-known benefactions as the mariner's compass, gunpowder, and the steam-engine to refute the suggestion; I will take one fact from a thousand that show what important events may result through the agency of the simplest inventions.

In the year 1746 the Pretender had appeared in Scotland, and France was sending him powerful succor. The French fleet and the English squadron passed each other during a very dark night. The most vigilant of the watch saw nothing, gave no signal; but, unhappily for France and its ally, Admiral Kowles, on leaving London, was provided with a glass

of recent and very simple construction, known under the name of the *night-glass*—a glass in which the artist had sacrificed magnifying power to illumination. With this instrument he descried, outlined on the horizon, numerous vessels; he pursued them, reached them, captured them: the humble night-glass decided the destiny of the Stuarts.

We may explain the sadness felt by Condorcet on returning to mathematics by the fact that even the most illustrious of geometers were at that time discouraged. They believed that they had reached the final limits of the science. We may judge this from the following passage I copy from a letter of Lagrange to d'Alembert: "I believe that the mine is already too deep, and, as we discover no new branches, sooner or later it must be abandoned. Chemistry and physics proffer a richer reward, with easier research. The taste, too, of the century does not lie in our direction. It is not impossible that the pursuit of geometry in the academies will some time become as rare as the study of Arabic is to-day in the universities."

Nomination of Condorcet to the Academy of Sciences—His journey to Ferney—His relations with Voltaire.

I learn by a letter from d'Alembert to Lagrange that Condorcet might have entered the Academy in 1768, at the age of twenty five years. His parents objected; to make science his official occupation was in their eyes derogatory to his station. He was received in 1769. His family yielded rather because tired of objecting than from conviction; for, six years later, Condorcet, already perpetual secretary of the Academy, wrote to Turgot, "Look with favor upon M. Thouvenel; he is the only one of my relatives who forgave me for not being a cavalry captain."

I must class among the first of Condorcet's academic works, an unpublished memoir upon the best organization of learned societies. This was intended for the Spanish Government. Influenced by the desire to calm the susceptibilities of the court of Madrid, the author has underrated certain phases of the question, but in it we find general views the fruit of an enlightened judgment and some curious anecdotes, which give the key, hitherto lost, to various provisions of our ancient academic rules.

It would show an entire want of understanding of the Spain of the XVIIIth century to dream of establishing an academy in which the Medina Celi, the d'Ossuna, &c., as representatives of the *nobility*, would have no place. Condorcet made this concession; he created honorary members, but stipulated for an equality of rights which would, he hoped, "raise the academicians in the eyes of the public, and perhaps in their own estimation, for savans unfortunately are not always philosophers." "To render," said Condorcet, "this union of the men of rank, who love science, and the savans devoted to her progress agreeable to both parties, this saying of Louis XIV should be kept in mind: 'Do you know why Racine and M. de Cavoye agree so well? Racine with Cavoye is a man of the court; Cavoye with Racine is a man of letters.'"

Perhaps I may be excused if, in this connection, I divulge from the manuscript of Condorcet the origin of an article of the first charter of our society relating to the nomination of men of rank:

"When we introduced," said our confrère, "honorary members in the Academy, for fear that true savans might be troubled by the hauteur or abuse of power of the monks, Fontenelle proposed that the class of honorary members should be the only one to which they could be admitted."

In the hope of inducing the Spanish authorities not to be influenced in their choice of members by the religious principles of candidates, Condorcet proposed to them this question: "In an academy composed of the heathen Aristotle, the Brahmin Pythagoras, the Mussulman Alhasen, the Catholic Descartes, the Jansenist Pascal, the Ultramontane Cassini, the Calvinist Huygens, the Anglican Bacon, the Arian Newton, the Deist Leibnitz, would there be any question of preference in regard to sect? Think you there would be consideration in such an assembly for anything but pure geometry and physics?"

Condorcet aspired at Madrid not only to secure for the director of the academy extended authority and large prerogatives; he desired, to use his own words, "to free the savans from the indignity, especially distasteful to them, of being under the protection of subalterns—an evil, in fact, of all times and all countries."

If the memoir of Condorcet ever sees the day, it may be considered that he pronounced too absolutely against the admission of foreigners among the resident members of the academies. If so, history may say in his defense that when he wrote it, the French Government was prodigal of its favors to foreigners of moderate ability, while it neglected men of superior talent born in the country. Witness, for example, an Italian,—Boscovich, provided with a large pension by the same ministers who refused to d'Alembert, notwithstanding his genius, and contrary to all rule, the reversibility of 1,200 livres of revenue, proceeding from the succession of Clairaut. See also this same individual, who is mentioned very slightingly by Lagrange and d'Alembert in the letters I have in hand, attempting to enter the Academy without waiting for a vacancy and on the point of success, thanks to the foolish admiration entertained for any one with a foreign termination to his name.*

Until 1770 Condorcet seemed desirous of confining his attention exclusively to mathematical and economical studies. After this period he threw himself into the world of literature. There will be no hesitation in discerning the cause of this revolution, when we remark that it coincides in date with the journey made by d'Alembert and Condorcet to Ferney, the home of Voltaire. Upon his return the young academician of twenty-seven years wrote to Turgot, intendant of Limousin, "I found Voltaire so full of activity and enthusiasm that one would be tempted to believe him immortal, if a slight injustice towards Rousseau and too

*This paragraph scarcely does justice to the distinguished Italian physicist.

great sensibility in regard to the follies of Fréron did not prove him to be human." With reference to some articles in the *Dictionnaire philosophique* (then unpublished), articles the importance and originality of which may be a matter of doubt, Condorcet says: "Voltaire works less for reputation than for the good of his cause. He should not be judged as a philosopher but as an apostle." Could there be an appreciation of certain works of Voltaire of greater delicacy and taste?

Voltaire became a sort of Dalaï-Lama of the intellectual world. His friends were undignified courtiers, blindly devoted to the caprices of their master, and endeavoring to obtain, by outrageous flattery and unlimited complaisance, one of those letters from Ferney, which then seemed in the eyes of the world a certain token of immortality. As for Condorcet, a few words will show his opinion of this foolish adulation.

Madame Necker received in 1776 some very flattering verses from Voltaire. Her husband, successor of Turgot as comptroller-general of finances, received a large meed of praise also in these verses. All this was undoubtedly a matter of little consequence, but Condorcet's rigid sense of propriety was disturbed; he considered it an act of weakness, and feared that the reputation of the philosopher would suffer by it; his uneasiness and displeasure were vented in expressions of considerable severity. "I am sorry for these verses. You do not consider the weight of your name. * * * You are like that class of people who would leave a Jupiter to applaud a harlequin. * * * I know your piece only by hearsay, but those who have read it tell me that apropos of Mme. Enveloppe (M. and Mme. Necker) you speak of Cato. This reminds me of a young foreigner who once said to me, 'I have seen three great men in France, Voltaire, d'Alembert, and the Abbé de Voisenon.'"

One more example of his independence and loyal frankness: Voltaire was desirous of committing to the stage, at Paris, the tragedy he had composed in his old age, *Irene*. Condorcet, dreading a failure, resisted the pressing request of Voltaire to assist him in this step, with judicious and firm criticisms, couched in respectful language, however, in which is never lost the disciple addressing the master. Thus, for example, in a letter at the end of 1777: "See, sir! See! you have accustomed us to perfection in action and in character, as Racine has accustomed us to perfection in style. * * * If we are severe it is your own fault."

Condorcet was a profound geometer. He belonged to that class of intellectual men who, even when witnessing the most beautiful tragedies of Corneille and Racine, would mentally ask at each scene, what does that prove? Voltaire surely *ought to* have cared little for the criticism of a judge so incompetent. Listen and decide:

"FERNEY, *January* 12, 1778.

"MY UNIVERSAL PHILOSOPHER: Your discretion is astonishing and your friendship day by day more dear to me. I am grieved and ashamed to have differed from you in regard to the last effort of an old man of eighty-four years. I believed, upon the faith of a few tears shed in my

presence by those who knew how to read and to assume without feeling passion, that if my little effort was well depicted and well acted it might produce at Paris a happy effect. I was, unfortunately, mistaken. I was aware of most of the faults you have the kindness to point out, and I add to them many others. I was endeavoring to make a picture out of a rough sketch, when your criticisms, dictated by friendship and by reason, came to increase my doubts of its worth. We can do nothing well in the arts of imagination and taste without the aid of an enlightened friend."

I feel that I am dwelling too long upon a point of the life of Condorcet which would seem to be already sufficiently illustrated, but I am irresistibly impelled to give a third and last incident of the frankness of Condorcet, which, in this case, truly amounted to a beautiful and noble action.

Voltaire and Montesquieu, did not like each other. Montesquieu even allowed this to be too evident. Voltaire, irritated by some pamphlets published by Montesquieu, wrote at Ferney, against the *l'Esprit des Lois*, several articles, which he sent to his friends in Paris, asking to have them published. Condorcet did not yield to the demand, imperious as it was, of the illustrious old man. "Do you not see," he remonstrated, "that to what you say to-day will be opposed your former praises of Montesquieu? His admirers, displeased by the way in which you take up some of his erroneous statements, will seek for similar inadvertencies in your own works, and they cannot possibly fail to find such, for even Cæsar describing his campaigns in his Commentaries, commits some inaccuracies. * * * You will, I hope, pardon me for not complying with your request in this matter, which you seem to have so much at heart. My attachment compels me to tell you what is for your advantage and not what will please you. If I loved you less, I would not dare to oppose you. I know the faults of Montesquieu, but he is worthy enough for you to overlook them." After this noble and loyal language, which was well calculated to rectify wrong ideas, it cannot be said that all the philosophers of the XVIIIth century were the vassals of Voltaire. The short response of the illustrious old man to the remonstrances of Condorcet is a document so valuable to the history of our literature that I cannot allow it to remain hidden in my portfolio; here it is:

"There is but one way to respond to what a true philosopher wrote me on the 20th of June. I thank him very sincerely. One ought not to blush to go to school, even if of the age of Methuselah * * * I repeat my thanks."

CONDORCET SUCCESSOR OF GRANDJEAN DE FOUCHY, AS SECRETARY OF THE ACADEMY OF SCIENCES—APPRECIATION OF HIS EULOGIES OF THE ACADEMICIANS.

Fontenelle had given so much éclat to the functions of the secretary of the Academy of Sciences that at his death no one wished to succeed

him. After much solicitation, Mairan consented to occupy provisionally the place in order to allow the learned body time enough to make a choice they would not afterwards regret. It was finally concluded that the only way to avoid all disagreeable comparison, was to give to the nephew of Corneille a successor who would not aspire to imitate him, and who would disarm all criticism by his extreme modesty. It was under these circumstances that in 1743 Grandjean de Fouchy became the official organ of the old Academy.

Fouchy had occupied this position for more than thirty years when Condorcet entered the learned company. The infirmities of the perpetual secretary and his age made him desirous of a collaborator, and for this purpose he cast his eyes upon his youngest confrère. This was to create survivorship, to establish a precedent, and produced violent opposition in the Academy.

After an excitement rarely caused by the discussion of an abstract principle, the question finally stood as follows: The successor of Fontenelle, shall it be Bailly or Condorcet? The struggle could not fail to be noble and loyal in all that concerned these two gentlemen. Condorcet, throughout his life modest in the extreme, thought it necessary to give some evidence of his fitness for the place, of his facility in the art of writing, and undertook to compose some academic eulogies. The regulation of 1699 imposed upon the perpetual secretary the obligation of paying a tribute of respect to the memory of the academicians removed by death. This is the origin of the numerous biographies, often eloquent, always ingenious, left by Fontenelle, and confined all of them to the interval comprised between the last year of the XVIIth century and 1740. Fontenelle in his annals of the society does not take up the past, but commences only with the time of his entrance into office. The admirable collection he has left us, therefore, leaves a gap of thirty-three years. The academicians, deceased between 1666 and 1699, had no biographer, and it is in this third of a century that Condorcet found the subjects for the exercise of his pen, and among them such savans as Huygens, Roberval, Picard, Mariotte, Perrault, Roemer, &c. These, his first eulogies, are written with a profound knowledge of the subjects treated by the academicians, and in a simple, clear, and concise style. Condorcet said, in sending them to Turgot, "If I were able to give them more brilliancy of expression they would be more pleasing, but nature has not endowed me with the gift of such union of words. If I attempt anything of the kind, one word, astonished at another, starts back in affright to see itself so associated. I am humiliated before those whom in this respect nature has treated so much better than myself." Condorcet was mistaken in his low estimate of work which procured for him a large majority in the Academy, and of which Voltaire, d'Alembert, and Lagrange always spoke with great esteem. On the 9th of April, 1773, d'Alembert wrote to Lagrange, "Condorcet merited well the place of secretary on account of the excellent eulogies he has published of the

academicians deceased since 1666. * * * They have had with us a complete success." "Your work," said Voltaire on the 1st of March, 1774, "is a monument to you. You always appear the master of those of whom you speak, but a master kind and modest; a king describing his subjects." Such commendation gave to these first essays of Condorcet a rank from which malevolence has in vain endeavored to reduce them.

Condorcet had hardly entered into his relation with M. de Fouchy, when he was commissioned to write several eulogies, among others that of the geometer Fontaine, deceased August 21, 1771. Difficulties unforeseen immediately assailed him. When he wrote the biographies of the earlier members of the Academy of Sciences a century had placed all things in their proper light—persons, labors, and discoveries,—and there was nothing for the writer to do but to express, in terms more or less happy, the irrevocable and already known decrees of posterity. Now he found himself in contact with the requirements, almost always blind, of families; with contemporary susceptibility sometimes of friends, always of rivals; finally with opinions based upon prejudice or personal animosity, than which nothing in the intellectual world is more difficult to eradicate. I suspect that Condorcet exaggerated somewhat these difficulties, although they were undoubtedly real, for he certainly spent an enormous amount of labor on his first eulogy of a contemporaneous academician. In his correspondence with Turgot we find him about the middle of 1772 already very busy with Fontaine. In the beginning of September he sent to the illustrious intendant a first copy of his work. The same eulogy, retouched and altered, in September, 1773, was on its way to Limoges. This, it must be admitted, was a long time to devote to an article of only twenty-five octavo pages. However, the maxim of Boileau was not in this instance without fruit. D'Alembert, writing to Lagrange, calls the eulogy of Fontaine a *chef-d'œuvre*. Voltaire says, in a letter of the 24th of December, 1773, "You have made me pass a half hour very agreeably. * * * You have relieved the dryness of the subject by a moral treatment noble and profound * * * which will delight all honest men. * * * If you need your copy I will return it to you, asking permission to make one for myself." Voltaire asking permission to copy for his own use a eulogy of Fontaine! Could there be a greater compliment than this?

To the eulogy of Fontaine succeeded that, not less piquant, not less ingenious, not less philosophic, of Condamine. The Academy and the public at large received it with unanimous applause. With the exception of the years 1775 and 1776, during which the Academy experienced no loss, the secretary had to provide annually until 1788, three, four, and even eight similar compositions. The style of these latter eulogies of Condorcet is grave and noble. There is in them no trace of affectation of manner or of effort; no desire to produce effect by expression, to cover, by striking or eccentric language, feebleness of thought.

Our confrère resisted with the more assurance the invasion of bad taste, the confusion of style, and the dithyrambic tendencies attempted by a certain school, because encouraged by Voltaire, who thus writes to him from Ferney, on the 18th of July, 1774: "It is without doubt a misfortune to be born in a century of bad taste, but what will you have? The public for eighty years have been content to drink bad brandy at their repasts."

It is now generally considered as a matter of hearsay that Condorcet lacked in his eulogies force, warmth, elegance, and sensibility. I differ from this opinion without fear of finding myself alone. In fact what have those who complain of his want of force to say to the following portrait of the academicians, happily few in number, whose names are connected with factious intrigue?

"Such intrigues have always been the work of those men tormented with the feeling of their own insignificance, who seek to obtain by noise what they fail to merit by worth, who having no right to reputation of their own, would destroy that merited by others, and overcome by petty malice the men of genius who oppress them with the weight of their renown."

To the critics who have accused Condorcet of a want of sensibility, I oppose the following passage from the unpublished eulogy of fathers Jacquier and Le Seur: * * * "Their friendship was not of that vulgar sort produced only by conformity of tastes and interests. It had its origin in a natural and irresistible attraction. In these deep and delicious friendships each endures the sufferings of his friend and enjoys all his pleasures. He has not a thought, he has not a sentiment, which his friend does not share; and if he is not always one with him, it is solely on account of the preference he gives him over himself. This friend is not only a man that one prefers to all other men, he is a being apart, whom none resembles; it is not his qualities, his virtues that one loves in him, for others may have these and yet not be loved the same; it is himself that one loves, and because it is himself. Those who have never experienced the sentiment can alone deny that it exists. * * * From the instant they encountered each other at Rome, everything was in common between them; troubles, pleasures, labors—glory even, the good, of all others, that two men very rarely share in good faith. Still each of them published separately a few articles, but these were of little importance, and in the judgment of him to whom they belonged not worthy to appear with the name of his friend. They desired perfect equality in the situations they occupied; if one obtained a distinction, he was not content until he had procured a similar honor for his friend. * * * Father Jacquier had the misfortune to survive his friend. Father le Seur succumbed to his infirmities in 1770. Two days before his decease he appeared to have lost all consciousness. 'Do you know me?' said Father le Jacquier to him a few moments before his death. 'Yes,' answered the dying man; 'I have just resolved a difficult equa-

tion with you.' Thus, in the midst of the destruction of his organs he had not forgotton the objects of his studies, and remembered the friend with whom he had all in common. Father Jacquier was forcibly taken from the arms of the dying man by the friends who, to use Jacquier's own expression, did not wish to lose them both. He resumed the chair his health had obliged him to vacate; caring little to prolong the days no longer brightened by friendship, he still wished to fill them with useful labor and thus divert the feelings of sorrow which nothing could cure. He knew better than to add the weight of time to that of grief. For minds that suffer, leisure is the most cruel torture."

The valuation Condorcet has given of the divers virtues of Condamine could, if we are not mistaken, be placed, without disadvantage, beside the eloquent speech Buffon addressed to the illustrious traveler on the day of his reception by the French Academy. It would bear as well comparison in elegance with the eulogy of the same academician, pronounced by the Abbé Delille, his successor.

The biographical compositions of Condorcet please because they contain what should naturally be their essence. The history of the human mind is in them viewed from a high standard. In the choice of details the author has constantly in view instruction and utility rather than entertainment. Without trespassing in the least upon truth, whose demands he places before every other interest or consideration, Condorcet is constantly ruled by the thought that the dignity of the savant is to a certain degree that of science; and that any applause which might be accorded to a witty portrayal of a ridiculous incident, would be a poor return for even a slight wrong done to the most modest branch of human knowledge.

We expect too much of *Monsieur plus que Fontenelle*, as Voltaire calls our confrère in several unpublished letters I have in hand, if we hope to find in his eulogies any chapters devoted entirely to the subsequent history of the sciences. Condorcet did not commit the error of giving to his auditors food stronger than they could digest.

Our former secretary was especially distinguished in his eulogies by the utmost impartiality, by philosophic thought, and by the interest he gave to the most simple biographical circumstances, by his constant abnegation of all personal feeling, of all party spirit, of all self-love. Condorcet described his own works, as well as those of Franklin, when he said of the latter: "We seek in them in vain for a line which could be suspected of having been written for his own glory."

The long career of Franklin certainly does not offer a better instance of frank, true modesty than is contained in this passage from the eulogy of Fontaine: "I thought, at one time, said this geometer, that a young man with whom I had been brought into connection had more talent and might attain greater eminence than myself. I was jealous of him, but I have not feared him since."—"The young man in question," added Condorcet, "is the author of this eulogy."

The class of the envious, always numerous and active, and ready to create disturbance, received through the mouth of Fontenelle a lesson of good sense and of wisdom, from which, unfortunately, they profited little. The first edition of Voltaire's Age of Louis XIV was about to appear. This was too good an occasion to irritate two great men against each other to be neglected. "How am I treated in this work?" asked Fontenelle. He was answered: "Voltaire commences by declaring that you are the only living person for whom he would make exception of the rule he had made for himself to speak only of the dead." "Stop," said the secretary of the Academy, "I do not wish to hear more. With anything Voltaire may add to that I must be content." Notwithstanding some criticism, Buffon, the immortal author of the *Histoire Naturelle*, would surely have been equally satisfied could he have heard the following tribute Condorcet renders to his eloquence: "The passages which escape from the pen of Buffon show the sensibility as well as the pride of his nature; but always controlled by a superior judgment, they make us feel, so to say, as if we were conversing with a pure intelligence, with only enough humanity to understand us and to be interested in our weakness. * * * Posterity will place the works of this great naturalist beside the dialogues of the disciple of Socrates and the teachings of the philosopher of Tusculum. * * * M. de Buffon, more varied, more brilliant, more prodigal of images than the two great representatives of Greece and Rome, joined facility to energy, grace to majesty. His philosophy, with a character less pronounced, is more varied and less melancholy. Aristotle seems to have written only for savants, Pliny for philosophers, M. de Buffon for all enlightened men."

After this quotation shall I injure Condorcet if I admit that Buffon never testified any kindness for him; that he was the most active friend of his rivals for the place of perpetual secretary of the Academy of Sciences and for that of member of the French Academy; that the idea of an academic censure, strongly recommended to the ministers of Louis XVI, and which constantly threatened the historian of our labors, originated with Buffon. It is worthy of note that the bickerings which at this time disturbed the Academy, as d'Alembert writes to Lagrange, on the 15th of April, 1775, to so great a degree "as to dishearten us for all serious study" and in which the illustrious naturalist took a prominent part, are revealed to us by the correspondence of La Harpe and numerous unpublished articles from other sources, but we seek in vain for any trace of them in the eulogies of the loyal secretary.

Fontenelle left a gap in his eulogies of deceased academicians, from 1699 to 1740; was this by design? One is tempted to think so, on observing among the omitted the Duke d'Escalonne, the famous Law and Père Gouye. I will leave no doubt of the kind in regard to Condorcet. If he did not make a eulogy of the Duke de La Vrillière, it was because in his eyes the title of honorary bestowed by the Academy

did not render honorable the minister who all his life made a cruel and scandalous use of the *lettres de cachet.* His timid friends calculated with uneasiness the danger of irritating M. de Maurepas, prime minister and brother-in-law of M. de la Vrillière. Condorcet answered: "Would you prefer that I should be persecuted for a foolish act rather than for a just and moral one? Do you not think I will in the future be more easily pardoned for silence, than for speech, since I am resolved, if compelled to speak, to tell exactly the truth?"

EULOGY OF MICHEL DE L'HÔPITAL—LETTER OF A THEOLOGIAN TO THE AUTHOR OF THE DICTIONARY OF THREE CENTURIES—LETTER OF A LABORER OF PICARDY TO A. M. NECKER, PROHIBITIONIST—REFLECTIONS UPON THE COMMERCE IN GRAIN—NEW EDITION OF PASCAL'S THOUGHTS—ENTRANCE OF CONDORCET INTO THE FRENCH ACADEMY.

Hitherto we have followed step by step the geometer, the perpetual secretary of the Academy. Now we see our confrère throw himself with polemic ardor into literary and philosophical controversy, appearing before the public, often anonymously, in order, he said, not to add his personal enemies to the enemies of his cause. Condorcet was already by fair title secretary of our society when the French Academy issued as the subject for a competitive essay the eulogy of Michel de l'Hôpital. Captivated by the scope, the interest, and also the beauty of the theme, our confrère entered the lists with all the ardor natural to a young man of unknown antecedents and with a reputation to make. He did not obtain the prize, however; the preference was given to a paper, to-day completely forgotten, by the Abbé Remi. Some of the causes for his disappointment have become known to me, and it may perhaps be worth while to notice them.

What did the French Academy desire in proposing the eulogy of de l'Hôpital for a prize essay? A superficial review of the literary work of the illustrious chancellor, a general sketch of his political and administrative acts, a homage to his memory, written in a more or less florid or exalted style. To-day this kind of composition is little to the taste of the public; indeed what the celebrated assembly demanded could hardly be dignified with the name of a discourse.

It was not thus Condorcet regarded the subject presented to him. In his mind utility was preferred to every other merit. The life of l'Hôpital seemed to him to offer a salutary example to those finding themselves in difficult circumstances obliged to choose between repose and the public welfare. He did not hesitate as to the character of his essay. It was a history of the life, not merely a eulogistic notice of l'Hôpital, he felt impelled to write.

The life of l'Hôpital: but this is a history of a century of terrible events, of a long succession of shameful disorders, of barbarous and

cruel actions, a century of intolerance and fanaticism. The field was large, but was not too much for the power, the knowledge, and the zeal of the writer. In his beautiful work Condorcet first shows us l'Hôpital in Italy, with the constable of Bourbon, in the parliament and council of Bologna. We then see him at the head of the finances. Later it is the chancellor, the minister, the statesman whose acts are revealed to the reader. The history of a life so full of incident could not properly be reduced to the limits of an article which could be read in sixty minutes—the time prescribed by the academy. Condorcet could not comply with this limitation, and his eulogy was three times longer than the programme allowed. This was sufficient in itself to make the rejection of the essay a foregone conclusion, to say nothing of the criticism the work excited in the literary Areopagus, of which the author of the Lyceum has preserved some specimens.

According to La Harpe, the style of the eulogy of l'Hôpital lacked harmony. The charge would have been a graver one had he said (if it could be said) that it lacked character, nerve, accuracy; that the ideas were neither new nor profound, and in that case it would be only necessary as a refutation to refer to such passages as the following:

"If Bertrandi (keeper of the seal of Henry II) has escaped the execration of succeeding centuries, it is because always petty even in the midst of his greatest power, always subaltern, even while occupying the highest places, he was too insignificant to attract attention."

"All the citizens wept over the ruin of their country. L'Hôpital alone did not despair. Hope never abandons noble souls. The love of the public good had with the chancellor all the characteristics, all the illusions of a veritable passion; l'Hôpital did not ignore obstacles, but felt his power to cope with them."

But "the obscurity of the style." In this criticism, I do not know what La Harpe means by "phrases which double upon each other." He is certainly clear enough, however, when he complains of Condorcet's want of dignity in speaking of vine-poles, billets of wood, and little pies, in the eulogy of a chancellor. We ought to hope in the spirit of loyalty that this remark of La Harpe's did not influence the decision of the Academy. Would you know where the expressions occur which made the critic so indignant? They are in a note, in which with reason the author denounces the strange, we might better say the deplorable regulations, which the prohibitive system suggested to even such minds as that of Michel de l'Hôpital. Yes, gentlemen; the fact cannot be denied; the virtuous chancellor prohibited the crying of little patties in the streets, in order—his words are unequivocal—to insure the pastry-shops from idleness and the people from indigestion. We may laugh in these days, we may be astonished, but none the less the sale of fagots, and vine-poles also, was forbidden. The laws of the time even determined the form of breeches and of farthingales. The fact that l'Hópital could approve such restrictions, shows clearly to what point even men of genius may yield to

the influence of their century. But I do not know in truth what influence Condorcet would have obeyed if he had substituted elaborate phrases for the technical expressions that l'Hôpital, even with his poet hand, employed, if he had used ornamental style apropos of farthingales, of billets of wood, and little patties.

Voltaire certainly did not agree with La Harpe and his friends in their opinion of Condorcet, for, on the 3d of October, 1777, he writes to M. de Vaines, "I have just read, with great satisfaction, l'Hôpital, by Condorcet; all that he does bears the mark of a superior mind." I find expressions no less significant in an unpublished letter of Franklin: "I have read with extreme pleasure your excellent eulogy of l'Hôpital. I knew before that you were a great mathematician; now I consider you one of the first statesmen of Europe." Such praise is surely equal in value to an academic reward.

"The *Lettre d'un Théologien* to the author of the *Dictionnaire des trois Siècles* is one of the most piquant articles published for several years. This pamphlet, unaccompanied by the name of the author, has been generally attributed to the illustrious patriarch of Ferney. Never has he been more happy in his criticisms, never more good-natured in his raillery." It is in such terms that a correspondence since published and become celebrated announced, in 1774, the anonymous pamphlet of Condorcet.

Voltaire, to whom the authorship was then unknown, thus writes to our confrère on the 20th of August, 1774: "There are, in the *Letter of a Theologian*, passages of humor, as well as of eloquence, worthy of Pascal." He then proceeds to prove that, notwithstanding a prevalent opinion, the Abbé de Voisenon could not be the author of a piece so remarkable. As to himself (Voltaire), he ought not to be suspected of it, for the letter indicates a profound knowledge of mathematics; and, he adds, "In consequence of the trouble I experienced with the elements of Newton, I renounced, forty years ago, that class of studies."

The audacity of the *Letter of a Theologian*, since he was suspected of writing it, caused Voltaire great uneasiness, and he took every occasion to disown its authorship. "I do not wish," he said, "at the age of eighty-three to die elsewhere than in my bed." He thus speaks of it to M. d'Argental (August 17, 1774): "One could not be more eloquent nor yet more foolhardy. This work, as dangerous as it is admirable, will undoubtedly furnish means of attack to the enemies of philosophy. * * * I desire neither the glory of having written the *Letter of a Theologian* nor the punishment which will follow it. I am sorry that so good a cause has been injured by being defended with too much spirit." Again Voltaire writes: "How could any one dare, unless in command of two hundred thousand soldiers, to publish so audacious a work?"

If he took every occasion, as we have said, and every way to declare that he was not the author of the *Letter of a Theologian*, mark well, this was because he needed repose and feared persecution; not because his

self-love was alarmed. He is evidently far from considering this supposition of the public injurious to him as a man of letters.

To such evidence as this would I call the attention of those who have considered Condorcet's style wanting in eloquence and depth.

In the society of d'Alembert our former confrère became a geometer. Turgot in his turn inspired him with a taste for social economy. Their ideas, their hopes, their sentiments became identical. It would really be impossible to mention a single point in science upon which Turgot and Condorcet differed, even in an almost imperceptible shade. They were both persuaded that in matters of commerce "entire and absolute liberty is the only law of utility and even justice." They believed that the protection accorded "to one special branch of industry was detrimental to all; * * * that the minute precautions with which legislators deemed it necessary to load their regulations were the fruits of timidity and ignorance, and without any compensation, the source of inconvenience, intolerable vexations, and real losses.

Turgot and Condorcet were, if possible, still more closely united upon the special question of commerce in grain. They maintained that entire liberty in this commerce was of equal importance to owners, to cultivators, to consumers, to employés; that there was no other remedy for the effects of local scarcity, no other means of reducing the mean price and diminishing the rate of variations, a matter of still more importance, for mean prices regulate the wages of the workmen. If, on the one hand, these rigorous principles were a formal discouragement to any yielding to disorderly clamors, or popular prejudices, on the other hand the two economists proclaimed distinctly that in times of scarcity the government ought to make provision for the poor. This relief should not, however, be dispensed blindly, but should be the price of work.

Turgot and his friend professed the maxim that there exist for every man certain natural privileges of which no lot in life can legitimately deprive him. They considered among the most important of these the right to dispose of his own intelligence, his own hands, and his own labor. Our philosophers also advocated the abolition of a number of tedious formalities, often absurd and always costly, which made the condition of the workmen an odious slavery. If the mastership and the wardenship were the despair of artisans and city workmen, the statutes of labor as severely affected the workmen of the rural districts. The labor statutes condemned to work without wages men who were dependent upon those very wages for their living. They allowed prodigality in labor because this cost the royal treasury nothing. The form of the requisitions, the hardness of the laws, the rigor of the penalties, added humiliation to misery. Turgot and Condorcet were the most ardent adversaries of this cruel servitude.

The two philosophers were not men who become tolerant of crime through seeing it constantly committed. The slave-trade excited their

utmost abhorrence. If I had time and space I could here transcribe a quite recent letter from M. Clarkson, in which this venerable gentleman renders touching homage to the active efforts of Condorcet in behalf of the holy crusade against this cruel practice, which had absorbed his long life. It is therefore very appropriate that our David has placed among the bas-reliefs of his beautiful statue of Guttenberg the noble figure of the former secretary of the Academy, as one of the most ardent enemies of the shameful brigandage, which for two centuries depopulated and corrupted the African continent.

At the death of Louis XV the public voice called Turgot to the ministry. First the marine was confided to him; a month after (August 24, 1774), the finances. In his new and brilliant position Turgot did not forget the intimate confidant of his economical and philosophical thoughts; he appointed Condorcet comptroller of currency. Condorcet accepted this favor in terms worthy to be recorded.

"It is said in a certain quarter that you are very generous with the public funds when you desire to oblige your friends. I should be sorry to give these foolish words any appearance of foundation. I pray you therefore do nothing for me in the way of remuneration just now. Although not rich, I am not pressed. Let me fill the place; trust me with some important work; wait until my efforts have truly deserved a reward."

Turgot during his ministry conceived, in 1775, a general plan for the interior navigation of the kingdom. This plan embraced a vast system of works for the improvement of the small as well as the large rivers, and for the excavation of canals to unite the natural ways of communication. The celebrated minister, in this important matter, had to defend himself equally from the lovers of display, from those who seeing certain rivers separated on the map by only a little white paper, draw lines from one to the other and call these meaningless scratches their plans; from those, finally, who do not know how to gauge the power of running water, nor how to calculate its effects. Therefore he hastened to attach to the administration three geometers of the Academy of Sciences, d'Alembert, Condorcet, and Bossut. Their mission was to examine plans and to supply any hydrographic information that might be required.

These operations, undertaken on so grand a scale, were stopped by Turgot's pecuniary inability to pursue them. Notwithstanding their short continuance they have left enduring results, although perhaps in more than one instance the counsel, contained in a memoir of Condorcet, was not sufficiently regarded: "Trust only such men who, could they join the Loire to the Yellow River of China, would feel no vanity on that account, but consider that a little zeal and some knowledge was all that had been necessary to accomplish the work."

The following extract from a letter of d'Alembert to Lagrange will appropriately end the brief notice just given of the works executed by the three geometers, the friends of Turgot:

"It will be told you that I am director of the canals of navigation with a salary of 6,000 francs. This is not true. We, Condorcet, Bossut, and myself have undertaken, through friendship for M. Turgot, to give him our advice in regard to these canals, but we have refused the salary offered to us by the comptroller of the finances."

When Turgot, as minister, wished to carry out the reforms he had conceived as simple citizen; when the comptroller-general found himself assailed by the cupidity of courtiers, the powers of parliament, and the generally conservative spirit of routine, which when great changes were to be made threw doubt upon the wisdom of his plans, Condorcet did not remain a mere spectator of the struggle; he on the contrary, entered into it with the utmost ardor; to a refutation of the work of Necker against the free traffic in grain, he especially devoted his pen, and for the first time he resorts to irony in the assumed *Letter of a laborer of Picardy to M. Necker, prohibitionist.* Voltaire writes thus to our confrère August 7, 1775:

"Ah, what a good thing, what a reasonable thing, and even what a beautiful thing is that *Letter to the prohibitionist;* it must attract all enlightened minds, although there are few such left in Paris, by its good sense and taste." I would not dare to say that good sense and good taste had deserted the capital, but I know that the witty *Letter to the prohibitionist* received little notice, and that Condorcet was obliged to publish a new refutation, more detailed, more methodical, and more complete, of the work of the celebrated and rich banker of Geneva. This second article was modestly entitled, *Reflexions upon the commerce in grain.* The author in it considers successively how these cereals are produced, how the difference sometimes occurring between the harvests of one place and another can be alleviated, and the regulation effected in proportion to wages. He treats also of the mean price and of its influence, and of the equalization of prices; of the effects of unbounded liberty in commerce, and the political advantages of such liberty. Condorcet then examines the prohibitions, both in a general way and in their relations to the rights of property and legislation. Descending, finally, from these abstractions to questions more personal, without mentioning names, he inquires how the authors of the prohibitory measures acquired popularity; he seeks for the origin of the prejudices of the people, and completes his work by some critical reflections, touching certain prohibitory laws, and the obstacles opposed to the good that liberty could produce.

All the aspects of a very difficult problem are frankly considered in a severe and simple style. The work is not a mere pamphlet; it extends to more than two hundred printed pages. Its publication excited general opposition among the numerous partisans of Necker. Writers of the highest rank became from the time of its appearance the implacable enemies of Condorcet. The Academy of Sciences and the French Academy were unpleasantly affected for many years by the consequences of the discords it produced.

With the mind free from prejudice I have asked myself if, under the circumstances, our confrère overstepped the bounds of proper criticism. I suppose no one will contest his right, which he used, conscientiously, to call the work of Necker a mere translation of the celebrated dialogues of the Abbé Galiani into prosy and pompous language, or to refer in this connection to the Greek statue, graceful and beautiful, which an emperor caused to be gilded and so ruined its beauty; but this aside, in going over the work of the former secretary of the Academy I find only one note that could have excited the anger of the warmest partisans of Necker. This note mentions a certain nobleman, designated, however, only by his initials, who had made a bad translation of Tibullus. The friends of Condorcet, uneasy lest the criticism they foresaw would trouble him, endeavored to console him. "Do not fear for my reputation as an author," he said to them; "I have just taken a better cook."

Such in substance was the terrible epigram which disturbed the court and the city, which brought discord even into the bosom of the two Academies, and which endangered the liberty of our confrère. I was disposed to blame Condorcet. It seemed to me that his hostile attitude was assumed on insufficient grounds; that Necker and his adherents had not used in regard to him or Turgot injurious language, but I was mistaken.

Buffon wrote to the celebrated banker "I do not understand this *hospital jargon*—these beggars whom we call economists." Necker accused the same writers "of seeking to deceive others, and of imposing even upon themselves." He described them as imbeciles, and even forgot his dignity so far as to call them ferocious beasts.

It is for the reader to decide whether any one has a right to complain who, after using a dagger upon his adversary, received in return only the prick of a pin.

I have told how Condorcet entered into the administration of the currency; his manner of leaving this important post was not less noble. As soon as Necker became comptroller-general of the finances, our confrère wrote to M. de Maurepas, "I have pronounced my opinion too positively of the works of Necker and of his character to retain any place which depends upon his disposal. I should dislike to be dismissed, but still more to be retained in office, by a man of whom I have spoken as my conscience has forced me to speak of M. Necker. Permit me to place in your hands my resignation."

Condorcet did not so exhaust his ire against contemporary heresies, as to have none left to combat the errors of ancient writers, even the most illustrious.

No one is ignorant that Pascal was occupied a few years before his death with a work intended as a defense of the truth of the Christian religion. This work was not finished. D'Arnaud and Nicole published extracts from it under the title of *Pascal's Thoughts upon Religion and upon other Subjects*. Condorcet, suspecting that this work had been brought

to light in the interests of a party and of certain mystical systems rather than for the reputation of the author, procured, in the beginning of 1776, a complete copy of the manuscripts of Pascal, obtained from them various passages that the saints of Port-Royal, with their Jansenistic consciences, felt obliged to suppress, arranged them methodically, and composed of the whole an octavo volume of 507 pages, copies of which were sent to all the friends of the author, but which was not offered for sale. Frankness compels me to say that the compiler of this new edition of *Thoughts* indulges, as did Arnaud, although in an entirely different spirit, in systematic suppressions. We hasten to add, however, that we have found a eulogy of Pascal by Condorcet, in which the great geometer, the ingenious physicist, the profound thinker, the eloquent writer is fully appreciated, and, with the most noble justice and impartiality, Condorcet adds critical commentaries to several of the *Thoughts* of Pascal. This audacity, in which Voltaire himself had already set him an example, excited great indignation; it was considered a sacrilege. To-day the public would have been more indulgent. The admiration, amounting to veneration, of that time is out of fashion now, and, if I do not deceive myself, the tendency is in the opposite extreme. We no longer think of asking, is such a criticism of a celebrated author irreverent, but is it just. Considered, then, from our present point of view, the remarks of Condorcet may be approved almost without exception.

When the author of the *Thoughts*, pushing misanthropy to its utmost limits, stated that if men were cognizant of all that was said by one of another there would be not four friends in the world; I like to find the commentator protesting against this antisocial decision and blaming Pascal for giving such a strange idea of his friends.

When, in his ardent war against man's love of his own greatness, Pascal insinuates that our actions, even those apparently most disinterested, are always tinged with feelings of self-love, by the hope of publicity and applause which follows in its train; I read with delight, in a note of the commentator, this touching anecdote borrowed from our *Annales Maritimes*, and which contradicts the melancholy declaration of Pascal:

"The vessel which contained the Chevalier de Lordat was wrecked and about to sink in view of the shores of France. The chevalier did not know how to swim; a soldier, an excellent swimmer, offered, if he would spring with him into the sea and would cling to his arm, to save him if possible. After swimming for a long time the strength of the soldier became exhausted. M. de Lordat perceiving this endeavored to encourage him, but the soldier at last declared that they must both perish. 'And if you were alone?' 'Perhaps I might still be able to save myself.' The chevalier let go his arm, and sank to the bottom of the sea."

Voltaire caused the book to be reprinted at his own expense in 1778. Hitherto it had received only a partial publicity. Voltaire, let it be said in his praise, thus became the editor and the commentator of the

young secretary of the Academy of Sciences. This was for Condorcet a very great honor, and, moreover, deserved, on account of the merit of the work. Am I mistaken, however, in supposing that in this action of Voltaire with the sincere homage of the author of the *Dictionnaire philosophique* was mingled some animosity against the Jansenistic writer; that the author of the *Henriade*, of *Mérope*, and of so many admirable smaller poems, saw with a secret joy the infallibility of that man attacked who, placed in the first rank among prose writers, had dared to say, even after the publication of the *Cid* and of *Cinna*, that "all poetry was in fact *only a jargon*"? A certain amount of anger must have influenced the pen of the illustrious poet when, in his appreciation of a work in which the praise is always so frank and the criticism so moderate, he says to Condorcet, "You have shown us the inside of the head of Serapis, and we find in it rats and spider-webs."

In Condorcet's edition of Pascal we find this thought oft repeated: "Speaking according to the natural light of reason, if there is a God, He is infinitely incomprehensible, since having no beginning and no end, he can have no connection with us. We are then capable of knowing neither what he is nor *if he is*." The portion of the phrase *nor if he is* is not found in the old editions of the works of the illustrious thinker. Condorcet seemed, therefore, to have been guilty of an inexcusable interpolation of the text. The suspicion that he had committed this grave offense gained weight when, in 1803, M. Renouard, the celebrated bibliographer, declared (these are his own words) that "an obstinate search through the manuscripts of Pascal, preserved in the Royal Library, had failed to discover the three contested words."

The fact stated by M. Renouard must at the time have caused some uncertainty even in the minds of those who had never doubted the perfect rectitude of Condorcet. In this day the testimony of this celebrated librarian is worth nothing, since we know that in 1812 M. Renouard frankly acknowledged that the fourth page of the almost illegible manuscript of the library did in fact contain the thought of Pascal as Condorcet had published it. To cut short all gratuitous supposition in regard to this supposed alteration of the precious manuscript, I will add that the contested words are found in an edition of the *Thoughts* anterior to that of Condorcet, and published by Father Desmolets.

I cannot allow this opportunity to escape of justifying Condorcet from an imputation of the same nature, shocking alike from its violence and its levity. Read, gentlemen, the article upon *Vauvenargues*, in the work of La Harpe, entitled *Philosophy of the XVIIIth century*. The irascible critic first recalls to memory the eloquent prayer which terminates the book of this moralist, and, immediately after accuses Condorcet of having affirmed, with anti-religious views, that the prayer was not by Vauvenargues. It is in the *Commentary upon the works of Voltaire*, says La Harpe, that this *philosophical falsehood* is to be found.

Never, assuredly, was reproach of such gravity expressed in plainer

terms. What must be my reply? The most positive denial of the charge: Condorcet never pretended that the prayer was not by Vauvenargues; he said very clearly, on the contrary, that it was. Can there be possibly such a thing as an anti-philosophical falsehood?

At the end of one of his best eulogies, that of Franklin, our confrère blames very severely those persons who regulate their conduct upon the maxim, old but of low morality, *the end justifies the means*, and denounces indignantly all success obtained by falsehood or perfidy. The actions of Condorcet were in accordance with these noble sentiments; his life was one long contest, but he never had recourse to arms obtained through disloyalty and untruth.

Formerly every nomination to the French Academy was an event, especially when men of the court were to be admitted. Condorcet took part more than once in the debates these occasions produced, but never allowed any consideration for rank to outweigh claims founded on true literary merit. When Saint-Lambert requested him to inform Turgot that the French Academy desired to give him a mark of its esteem and to nominate him in the place of the Duke of Saint Aignan, Condorcet, although he desired greatly that his friend should become a member of the Academy, very plainly advised him to decline the nomination if his acceptance should cause any one making literature a profession to be rejected by the court, which was at that time always consulted before the election of a member. Our confrère thus manifested his true esteem and profound respect for the love of letters.

His counsel was addressed to one worthy to appreciate it. Turgot did even more than his friend had advised. Here is his answer: "Thank for me M. de Saint-Lambert. At this time it would not be suitable for me to draw upon me the eyes of the public for any other purposes than the affairs of my ministry. I think there should be an effort made to elect La Harpe. If this does not succeed, why should not the Academy take the Abbé Barthélemy? And there is M. Chabanon; not to consider his claims to the nomination seems to me to be treating him very severely. He is not, whatever may be said, without talent. They were not always so particular."

Perhaps in our time affairs are conducted as nobly; but even if this is so, I do not regret these citations, for they prove that our fathers were at least as worthy as ourselves.

Condorcet entered into competition in 1782 for the place of Saurin in the French Academy, and carried the nomination by only one vote over Bailly, the other candidate. The contest over the election was very warm, d'Alembert representing one side and Buffon the other. La Harpe gives some idea of the zeal manifested since he tells us that when the issue of the votes was declared d'Alembert cried out before the whole Academy: "I am more pleased to have gained this victory than I would be if I had found the quadrature of the circle."

The disfavor that this nomination drew upon Condorcet (the expression of this feeling is found in most of the writings of the time) is to me inexplicable. Were the literary claims of Bailly to the nomination so indisputably superior to those of Condorcet that the latter could not honestly have received the preference? "Should speculation," d'Alembert maliciously remarks, "in regard to an ancient people, about whom every thing is known except their name and place of abode, overbalance the ingenious, learned, and often elegant descriptions of men of our time?"

In any case, supposing Condorcet was mistaken in his claims to an Academic chair, the illusion was a very natural one. Thus in the unpublished *Correspondence* of Voltaire, I have so often quoted, I read, under the date of 1771: "You should do us the honor of belonging to the Academy. We have need of men who think as you do." Is this said in mere politeness, and not seriously?

I pass over an interval of five years, and on the 26th of February, 1776, find in another letter of the great poet: "Belong to our Academy; your name and your eloquence will have some effect upon the set of hired assassins established in Paris." The same desire is repeated with variations in several letters of the month of March. That of the 16th contains this passage: "I repeat to you that if you do not this time do me the honor of joining us, I shall go and pass the rest of my *youth* at the Academy of Berlin or that of St. Petersburg." The old man becomes afterward still more pressing: "I wish you would promise me," he writes on the 9th of April, 1776, "for my comfort, that you will take my place in the Academy and aid our assembly with your words, as you have supported it with deeds. Be received by M. d'Alembert, and I will feel greater confidence that all will be well."

Voltaire the sceptic doubts everything except the merit, the attachment, and the gratitude, of our confrère.

We are now at the commencement of 1776. At the close of the year following, the 24th of November, 1777, the author of *Mérope* wrote again to our former secretary: "I shall always be tenderly attached as long as I live to him who forms the glory of the Academy of Sciences, and I hope he will some day do the same for the French Academy. Since the history of literature makes regretful mention of many candidates who entered the Academy only after soliciting long for the honor, I may be permitted to show one man of letters who became an academician only after he had been long solicited."

CONDORCET TESTAMENTARY EXECUTOR OF D'ALEMBERT.—HIS MARRIAGE WITH MADEMOISELLE DE GROUCHY.

The ordinary, the regular course of things in this world brings some days of mourning, of tears, and of deep sorrow even into the least troubled lives. Condorcet experienced this in 1783. That year, on the 29th of October, death robbed him of his friend, the illustrious geometer,

who under all circumstances had been his guide, his support, his foster father.

The great man, who had succumbed in the plenitude of his mathematical genius, had assumed as a rule of conduct this maxim, which will no doubt by many be considered very puritanical: "The use of the superfluous is wrong, when others are deprived of the necessary." D'Alembert acted through life upon this principle and died, therefore, without fortune. In his latter days he was not only a prey to cruel physical pain, the consequences of a dreadful malady (the stone); he suffered perhaps even more deeply from the impossibility to which he had been reduced by his constant generosity, of suitably rewarding his two faithful servants. A classical incident occurred suddenly to the memory and brought peace to the mind of the celebrated academician.

Eutamidas bequeathed to one of his friends the mission of taking care of his mother, to another of marrying his daughter; a similar testamentary request confided to Condorcet the duty of providing annually for the needs of the two servants. The mission lasted long: Condorcet placed it among the number of his first duties and fulfilled it with religious fidelity. General and Madame O'Connor have continued his example.

The arduous duties devolving upon the secretary of the Academy of Sciences, the obligation of maintaining an active correspondence with the cultivated men of all countries of the civilized world, an irresistible inclination to take part in the debates of which the social and political condition of the country was every day the object, very early decided Condorcet to give up general society. The sacrifice could not have cost him much, for in the eulogy of Courtauvaux he denounces its amusements as dissipation without pleasure, vanity without motive, idleness without repose. Outside of his scientific relations our confrère frequented only a few choice social gatherings where, in contact with the eminent men of the time, the young men learned to discuss the most exciting questions with moderation, delicacy, and modesty. It was in one of these family reunions that Condorcet met, for the first time in 1786, Mademoiselle Sophie de Grouchy, niece on her mother's side of M. M. Fréteau and Dupaty, members of parliament. Like all the rest of the world our confrère admired, first, the rare beauty, the distinguished manners, the brilliant and cultivated mind of this young person. Soon he discovered that these attractions were united to a noble character, a heart most true, an affectionate and benevolent nature. Condorcet then became strongly attached to the young lady, and demanded her in marriage. Our confrère was at this time forty three years of age, and had only a moderate income; but such was the violence of his passion that he made no written agreement, but only a verbal contract with his future parents for the dowry of his wife. This, gentlemen, is very far from the calculating, cold disposition which has been attributed to Condorcet, a character drawn from that of certain of his friends for whom he professed an unlimited admiration, and with whom he was wrongfully supposed to be in sympathy in every way and upon all subjects.

At that time, with very few exceptions, savans, mathematicians especially, were regarded by the world as beings of a separate order of nature. They should, it was thought, like ecclesiastics, be interdicted the concert, the ball, the play. A geometer who married was considered as infringing upon a principle of right. Celibacy seemed the obligatory condition of whoever devoted himself to the sublime theories of analysis. Was this mistake altogether on the side of the public? Were not the geometers themselves instrumental in promoting such views? Listen, gentlemen, and judge for yourselves.

D'Alembert receives indirectly from Berlin the information that Lagrange is about to give his name to one of his young relatives. He is somewhat astonished that a friend with whom he is in correspondence has told him nothing of such intentions. This does not, however, prevent him from mentioning the matter in a bantering way. "I learn," he writes on the 21st of September, 1767, "that you have made what we philosophers call the perilous leap. * * * A great mathematician ought above all things to know how to calculate his own happiness. I do not doubt, then, that, having made this calculation, you find marriage to be the solution." Lagrange responds in this singular manner: "I do not know whether I have calculated well or ill, or rather whether I have calculated at all, * * * or I may be like Leibnitz, who, by force of reflection, never could come to a determination. I must confess to you that I have never had a taste for marriage, * * * but circumstances have decided me * * * to engage one of my relatives * * * to come and take care of me and all that concerns me. If I have not informed you of this it was because it seemed to me a matter of so little importance in itself that it was not worth while to trouble you with it."

The marriage of Condorcet would also have appeared to me a matter of no importance, and not worth mentioning in this biography, if it had been, as d'Alembert suggests, the result of a calculation. On the contrary, without calculation of any kind, but solely in obedience to the inspirations of a feeling heart, Condorcet had the happiness to find a companion worthy of him. The beauty, grace, and wit of Madame de Condorcet formed a sort of miracle. The most decided adversaries of marriage among the savans, especially the mother of the Duke de La Rochefoucauld, the respected Duchess d'Anville, yielded so far as to say to our former secretary, "We pardon you."

CONDORCET AS A POLITICIAN—A MEMBER OF THE MUNICIPALITY OF PARIS—COMMISSIONER OF THE NATIONAL TREASURY—MEMBER OF THE LEGISLATIVE ASSEMBLY—MEMBER OF THE CONVENTION—HIS VOTE IN THE TRIAL OF LOUIS XVI.

We now enter into a series of considerations and events of a totally different nature from those which have hitherto occupied our attention.

Condorcet is about to take part in the most important events of our revolution.

If it is true, as a celebrated diplomatist has said, that speech often serves to disguise thought, we may add that under certain circumstances, silence is a very unequivocal means of expression. Suppose, for example, that I say nothing of the political life of Condorcet, who would believe that it was not made up of blamable deeds? Heaven forbid that I should voluntarily give reason for a conjecture so contrary to the truth, that I should become the tacit auxiliary of the many scurrilous writers who attacked with a sort of fury the former secretary of this Academy. Every one, in his own cause, has assuredly the right to meet with silent contempt the abuse of adversaries he may consider beneath notice; but this alone is not sufficient for him whose mission it is to defend an honorable citizen, an illustrious brother, the victim of the basest calumnies.

In the society of Turgot our brother became a man of progress not only in social but political economy. Placed near the seat of power for eighteen months, he saw in their most secret details the play of the worm-eaten wheels of the ancient monarchy. Condorcet comprehended their insufficiency, and, although changes were to him personally prejudicial, he never allowed an opportunity to escape of urging their necessity. I do not know whether such noble disinterestedness is common at present; it was not at least in the times of which I speak. Witness, for instance, the naive question addressed to Condorcet by a *Fermier général*, enjoying an income of two or three thousand livres: "Why innovate? Are we not well off?"

No, assuredly; honest men were not common in the days when Turgot, the minister, said to our confrère: "You do very wrong to write to me by the post; you may injure yourself and your friends. Write to me, I pray you, only by special opportunity, or by my couriers."

The "*black* cabinet" opening letters addressed to a minister! Is anything further necessary to show the character of the times? In order to understand the ameliorations France desired, Condorcet did not need to consult the instructions that in 1789 the members of the constituent assembly brought from all parts of the kingdom. His programme of action, perfectly in accord with the best conceived resolutions of the provincial assemblies, was written out in advance. He had found its elements in an earnest and philosophical study of the natural rights, of which a society well organized will not, and cannot, deprive the most humble citizen. The ideas, the wishes, the hopes of our confrère form the chief interest of the *Life of Turgot*, published in 1786. To-day, even, when most of the privileges claimed by Condorcet in the name of reason and humanity have been definitely acquired, publicists may still learn much from reading the work of our confrère. They will see in it, with astonishment perhaps, but also with full conviction, that the vague principle of the greatest good of society has often been a fruitful source of injurious laws, while they will always secure regulations and

prescriptions the necessity and the justice of which must be acknowledged by all, when intent only upon securing to the public, the enjoyment of their natural rights.

I do not know whether, in the present state of opinion, my appreciation of the work of the illustrious philosopher will be generally approved. I may at least assert that every loyal man must experience one sentiment, that of respect, in witnessing with what vigor, since the year 1786, the Marquis Caritat de Condorcet attacked the privileges of the nobility.

Condorcet after much study had written, at the dictation of his conscience, the imperative mandate he was prepared to issue, if circumstances ever gave him the political power. I perceive in this programme many points which have never been decided according to his views, either in fact by our assemblies, or in theory by publicists in general.

Condorcet did not wish two chambers; but that which he demanded, particularly that which seemed to him the base of a well considered social organization, was a legal and periodical means of revising the constitution, so as to adjust peacefully the disaffection of parties.

The combination of two chambers seemed to him a useless complication, in some cases leading to results evidently contrary to the wish of the majority. He believed "that in the deliberations of a single assembly are found all the elements necessary to secure to legislative enactments all the consideration and the maturity of judgment required for their justice and wisdom." Franklin, a decided partisan of a single chamber, confirmed Condorcet in his views. The eulogy of this great man furnished later to our brother a natural occasion for the development of his opinion, which he seized with avidity. Also, in this same eulogy the learned secretary proclaimed as an inevitable source of evils and disorder any constitution considered unchangable, any constitution which did not provide means for modifying such of its regulations as might cease to be in harmony with the state of society.

With Condorcet as simple citizen or as member of our assemblies, the political man is concentrated into these two ideas,—natural rights, rights imprescriptible which no law can infringe without injustice, and political constitutions containing in themselves a legal means for the reform of abuses. This was his evangel. Whenever his favorite principles are combatted or even only questioned he hastens to their defense. His language then becomes animated, passionate. Read, for example, this passage from a letter he wrote on the 30th of August, 1789, at the time when the constituent assembly had just rejected the proposition made by Mathieu de Montmorency to secure by means of an express proviso the possibility of future improvements in the fundamental compact:

"If our legislators aspire to work for eternity, they ought to bring down a constitution from the skies. To Heaven has alone been accorded

the right to give immutable laws. We have lost the art of working miracles and of making oracles speak. The Pythoness of Delphos and the thunders of Sinai have for ages been reduced to silence. The legislators of to-day are but men, who can give to men—their equals, only laws as fleeting as themselves."

The first functions of a political order exercised by Condorcet were those of member of the municipality of Paris. In this capacity he was the author of the celebrated address presented by the city to the constituent assembly, to demand the reform of a very important law, the law which had just been passed, and which made the right of citizenship and the other political rights to depend upon the quota of its contributions. The remonstrances of Condorcet and his colleagues were not without effect.

Condorcet was still exercising his municipal functions when he demanded, this time in his own name, that the King should always select his ministers from a list of those qualified, the formation of which should be one of the principal prerogatives of the representative assembly. Would such a process prevent a bad selection? I certainly hesitate to affirm it. I am certain that the list of candidates would be very difficult to make, and would compel laborious investigation.

Condorcet was much more in sympathy with the actual world when he pointed out the dangers attached to the creation of assignats, when he indicated almost infallible means for obviating all the inconveniences of this paper money.

The flight of the King and the circumstances of his return threw discouragement over the minds of the most decided partisans of the monarchial system. La Rochefoucauld, Dupont de Nemours, and others, even held meetings where the means of establishing a republic without too great violence were very seriously discussed. This project was afterwards completely abandoned. Condorcet, an active member of these extra-parliamentary debates, did not consider himself bound by the decisions of the majority to keep secret the opinions he had given; he allowed his speeches to be read at the *Cercle Social*, and this assembly caused them to be printed. From this time dates the unhappy rupture which suddenly, and without hope of restoration, separated him from his best, his oldest friends, and in particular from La Rochefoucauld.

When the questions which the arrest of Varennes inevitably raised reached the national tribune, Condorcet, although he was not a member of the assembly, became in it an object of attacks and of violent personal abuse. The illustrious publicist admitted without hesitation that his opinions might be in part erroneous; but considering the character of those who made such fierce war against him, their disdain excited his surprise. "Was it excessively ridiculous," he asked himself (I copy here a passage from a manuscript), "that a geometer of forty-eight years, who for nearly a third of a cen-

tury had studied political science, who was the first perhaps to apply mathematical calculation to this science, should be permitted to have a personal opinion upon questions debated in the constituent assembly?" Parliamentary customs were not yet fully developed. Condorcet could not divine that a day would come when, in order to be allowed to speak upon all subjects, it should be imperatively necessary to have made no special study of any.

In 1791, after quitting the municipality of Paris, Condorcet became one of the six commissioners of the national treasury. The memoirs which he published at this period would occupy a prominent place in the eulogy of an author less fruitful and less celebrated. Embarrassed by want of time and abundance of material, I cannot even mention their titles.

Condorcet, having renounced towards the latter months of 1791 the place of commissioner of the treasury, went to Paris as candidate for the legislative assembly. Never was there a candidate more violently opposed, never did the venal press indulge in more libels. It was my duty to investigate and weigh these emanations of party spirit; but I should weary my audience if I attempted to give an analysis of them. I must confess that, amidst the torrent of calumnies and absurd accusations, there was one assertion made in such a clear and categorical manner that in the absence of an equally formal denial, which I could nowhere find, the wrong attributed to our confrère made me really uneasy. Thanks to the respectable M. Cardot, for a long time Condorcet's secretary, all clouds of doubt have disappeared. Condorcet, said his accuser, visited the court nightly, and especially *Monsieur*, brother to the King, even at the time when he was attacking them in his writings, and then follow the names of persons who could testify to these clandestine communications. "Yes! yes!" cried the chief clerk of our secretary, when I consulted him, "I remember that grave imputation, but I remember also that it was proved that the mysterious nocturnal visitor was not Condorcet, but Count d'Orsay, master of the household of *Monsieur*." You see, gentlemen, in times of political animosity, how easily the reputation of the most honest man may be compromised.

Hardly had he been nominated to the legislative assembly when he became one of its secretaries. Later he was raised to its presidency. Timidity, great feebleness of the lungs, the impossibility of preserving his *sang-froid* and presence of mind amidst the noise, agitation, and tumultuous movements of a large concourse kept him away from the tribune, which he mounted only on rare occasions, but whenever the assembly wished to make a serious and impressive address to the French people, the army, to interior factions, or foreign nations, it was always Condorcet who became its official organ.

During his legislative career Condorcet gave especial attention to the organization of public instruction. The fruit of his reflections upon this important subject are recorded in five memoirs, published in the

Bibliothèque de l'homme public, and in the exposition of his ideas on the law which he presented later to the legislative assembly.

Condorcet entirely abandoned the beaten tracks. He has submitted to very careful examination even those institutions and methods which by their universality seemed beyond question. He threw new light upon the subject by considering it from points of view well worthy the attention of the legislator, as an enlightened friend of his country, on account of their novelty and importance. Whatever may be the opinion of the matter, the impartial reader cannot fail to render homage to the clearness of view, the largeness of conception manifested by Condorcet in the various parts of his work.

Here, according to date, should be mentioned a motion of Condorcet I cannot fail to notice. The compass of this motion I am sure has been seriously exaggerated. This assertion has not been made without mature reflection, for it places me in direct opposition to one of the most illustrious men of our time. It requires considerable confidence in the power of truth to dare oppose alone an error, without doubt involuntary, but supported by the prestige of the highest eloquence.

Parliamentary history offers nothing more touching, more curious, than the analysis of the session of the constituent assembly of the 19th of June, 1790. The day when Alexandre Lameth solicited the removal of four chained figures, then to be seen in the Place des Victoires at the feet of the statue of Louis XIV, an obscure deputy of Rouergue, M. Lambel, cried from his seat: "To-day is the tomb of vanity. I demand that henceforth it shall be forbidden any one to take the titles of duke, marquis, count, baron," &c. Charles Lameth supported the proposition of his colleague; he desired that in the future no one should be called noble. Lafayette considered the two demands so evidently necessary, that he thought it superfluous to support them by many remarks. Alex. de Noailles agreed with the latter, but considered the suppression of liveried servants equally urgent. M. de Saint-Fargeau proposed that no one should bear any other name than that of his family, and set the example by immediately signing his own motion,—"Michel Louis le Pelletier." Lastly, Matheu de Montmorency insisted that armorial bearings, heraldry, which were among the most apparent remains of the feudal system, must not be spared, and demanded their immediate abolition. These propositions were presented, discussed, adopted, almost in as short a time as I have taken to give an account of them. In all this our confrère did not take an active part, for the very simple reason that he was not a member of the constituent assembly. If it was a fault to rupture so suddenly all connection between the past and the present, Condorcet, at least, cannot be blamed for it. We have, in fact, since learned, through the memoirs of Lafayette, that upon the question of the abolition of heraldry, our learned philosopher did not agree with Montmorency. It seemed to him, on the contrary, more in accordance with the true principles of

liberty, rather than to suppress armorial bearings, to permit every one, the plebeian, the artisan, the beggar, as well as the noble, to assume them if so inclined.

The law for the abolition of titles of nobility contained nothing specific concerning the penalties attached to its infringement. Such a law, a law without proper sanction, is never observed in any country, and soon falls into disuse. It was, no doubt, to recall to mind its existence, that on the anniversary of the day on which it was passed by the constituent assembly, the 19th of June, 1792, the legislative assembly at Paris caused to be burned a large quantity of brevets or diplomas of dukes, marquises, vidames, &c. The flame was still burning at the foot of the statue of Louis XIV; the last contribution to it was, perhaps, the original title of the Marquis Caritat de Condorcet, when the heirs of this family demanded of the national tribune that the same measure should be extended to all France. The proposition was unanimously adopted.

This proposition has been textually inserted in the *Moniteur*.* It evidently relates only to titles of nobility. A decided partisan for unity in the legislative power, Condorcet hoped to defeat his adversaries (who still meditated the creation of two chambers,) by the destruction of certain parchments which they seemed inclined to consult when composing the personnel of their senate. The artifice was perhaps shabby, puerile. Still it does not authorize an illustrious writer, the honor of our literature, to present it as the immediate cause of the abandonment of certain historical works, because these works had ceased entirely a year before, in 1791. It still less authorizes a serious journal, and of recent date, to tell us that the new Omar, Condorcet, caused to be burned the extensive records of the learned associations, for these records were not burned; the proposition can be read as Condorcet made it, and it refers absolutely only to titles of nobility; for (and this moral argument is in my eyes even stronger than positive facts and dates) there never could have existed a French chamber, whether created by a monarch or by the populace, with elections of any order, which would have sanctioned by a unanimous vote the barbarous, anti-literary, anti-historic, anti-national act, so lightly attributed to the former secretary of the Academy.

It is at about this epoch, and not after the condemnation of Louis XVI, as has erroneously been supposed, that, by the formal order of Catherine and Frederick William, the name of Condorcet was effaced from the list of members composing the academies of St. Petersburg and of Berlin. Notwithstanding all my efforts, I have not been able to discover whether these two acts of disapproval distressed to any great degree our secretary. Not a line, not a single word of his numerous manuscripts and printed works refers to this event. Condorcet imagined perhaps, that as the imperial and royal confirmations added little to the

* See the discourse of Condorcet, of the 19th of June, 1792.

actual value of the literary titles he could regard the withdrawal of these confirmations as a fact little worth his attention.

Condorcet had seen arise in the legislative assembly the personal dissensions which, growing in bitterness, threatened to imbrue the convention in blood, and bring the country to the verge of ruin. He was never willing to take part in these combats when they seemed to center upon individual names. All his tendencies were to moderate rather than to excite these broils. Several times he addressed to the ears of the factions these words, full of wisdom: "Think a little less of yourselves and a little more of the public good."

In times of revolutionary agitations, he who is governed by principle alone is soon considered weak by all parties. Of this Condorcet was an example. Witness on the one hand this passage from Madame Roland: "We may say of the intelligence of Condorcet in relation to his person, it is a fine essence pervading cotton." On the other hand, the electoral corps of Paris, then completely Jacobin, when called upon to nominate its representatives to the convention, withdrew from Condorcet the mandate which had made him a member of the legislative assembly.

A little later in this same convention, for which five departments, in default of that of the Seine, had nominated Condorcet, we will see that it is possible to be both cotton for personal questions and bronze for questions of principle.

Condorcet acted as one of the judges of Louis XVI. I know that, by a sort of tacit consent, it is customary to consider this period of our history as ground too hot to dwell upon with prudence. I think such reserve objectionable. The mystery in which the events of the time are enveloped tends to promote the belief that, to the eternal shame of our national character, not a patriotic feeling, not an act of courage, not an elevated idea, not a sentiment of justice, was brought to light during the long period of the painful drama.

The large portion of the public to whom the Moniteur and other official sources of information are interdicted, on account of their high price or their rarity, are acquainted with this part of our annals only through a few barbarous phrases, several of which have been repeated from generation to generation, but are none the less contrary to the truth. The overcaution, which under such circumstances would prevent the historian from attributing to each person his real part of the responsibility, is, in my opinion, inexcusable. I will, therefore, tell you faithfully and without reticence what was Condorcet's conduct during the celebrated trial.

Could the King be tried? His inviolability: was it not absolute according to the terms of the constitution? Liberty: was it possible in a country where positive law ceased to be the rule of judgment? Would it not be violating an eternal axiom, founded upon humanity and upon reason, to prosecute actions which no anterior law had stamped as derelict or criminal? In strict justice, should not the mode

of judgment have been regulated before the time of the offense or crime? Was it to be hoped that a fallen sovereign might find impartial judges among those he once called his subjects? If Louis XVI had not counted upon absolute inviolability, are we sure that he would have accepted the crown?

Behold the series of questions, assuredly very natural, which Condorcet presented to the tribune of the convention, and which he submitted to a severe discussion before the commencement of the trial of Louis XVI. I ought to enumerate them if only to show to what extent they may deceive themselves to whom the history of our revolution is known only by a sort of oral tradition, which represents all the members of the convention as tigers, thirsty for blood, taking no care to cover their fury with even the appearance of right and legality. Condorcet admitted that the King was inviolable, that the constitutional compact justified all the acts of power which were delegated to him. He did not believe that the same rule should be extended to personal derelictions, if they were without necessary connection with the functions of royalty. The most perfect codes, said Condorcet, contain defects. That of Solon, for example, makes no mention of the parricide. The monster guilty of such a crime, should he therefore remain unpunished? No, certainly; to him was applied the penalty of the murderer.

In admitting condemnations by analogy, Condorcet desired at least that the tribunal, constituted with unusual prerogatives, should be based upon dispositions favorable to the accused; he desired the right of recusation more extended; the necessity of a larger majority for the condemnation, &c. According to his views, the judgment of the King should have been confided to a special jury, chosen from the whole country by means of electoral colleges.

The right to punish the King did not seem to our confrère so incontestable as the right to judge him. The idea of a sentence in some sort moral might seem, perhaps, strange; Condorcet saw in it the occasion of showing to Europe, by a legal discussion, that the change of the French constitution had not been the effect of the simple caprice of some individuals.

After having developed the opinions, true, false, or questionable, that have just been presented to you, Condorcet declared, with no less sincerity, that, without violating the first principles of jurisprudence, the convention could not judge the King. A legislative judiciary was in his eyes a veritable chimera. Such an assembly, at once legislator, impeacher, and judge, seemed to him a monstrosity, an example the most dangerous. In all times, he said, and in all countries, the judge has been considered lawfully reprehensible who in advance manifests any opinion of the culpability or the innocence of the accused. In fact, justice cannot be expected from men who, forced to renounce an opinion publicly expressed, must consequently incur at the least the reproach of fickleness. Now, said Condorcet, in a solemn declaration

addressed to the Swiss nation, the convention has already pronounced upon the culpability of the King. Condorcet as to the rest demanded that in the case of condemnation, the right should be reserved of mitigating the punishment. "To pardon the King," said he, "may become an act of prudence; to conserve the power to do so is an act of wisdom."

It is in the same discourse that I read the words, whose beauty are enhanced by the solemn circumstances of the speaker:

"I believe the punishment by death unjust. * * * The abolition of the death penalty would be one of the most efficacious means of elevating the human species by assisting to destroy the inclination towards ferocity, which has long dishonored it. * * * Punishments which allow correction and repentance, are alone suitable for the regeneration of the race."

The convention, scorning all the scruples Condorcet had raised, constituted itself a sovereign tribunal for the trial of Louis XVI. Our brother did not decline to take part. Was this one of those cases in the body politic, when the minority must blindly submit to the yoke of the majority? The most criminal of usurpations is, without contradiction, that of the judicial power; it wounds both the intelligence and the heart. On such a subject, could the testimony of the conscience be placed in the balance against the material result of the ballot? Let us not always carry severity to the extreme; let us remember that in the open sea, in the midst of the storm, even the most intrepid sailor is sometimes seized with dizziness the timid landsman safe on shore has never experienced. It would certainly have been more Roman to have refused the function of judge; it was more human, according to the ideas of Condorcet, to accept it. Condorcet refused to vote for the punishment of death. Any other penalty he considered could be awarded, and he demanded an appeal to the people.

Discussion of the constitution of the second year.—Condorcet an outlaw—His retreat with Madame Vernet—His sketch of a history of the progress of the human mind.—Flight of Condorcet—His death.

Of all the writings of Condorcet none exercised so fatal an influence upon his destiny as the plan for the constitution for the second year.

In the midst of the incomparable efforts made by the convention to repulse the armed enemy, to suppress the civil war, to create financial resources, to resupply the arsenals, the political organization of the country was not forgotten; a commission composed of nine of its members was intrusted with the preparation of a new constitution. Condorcet was one of the nine. After several months of assiduous labor and of profound discussion, this commission presented, on the 15th and 16th of February, 1793, the result of its deliberation. The new plan of the constitution consisted of not less than thirteen heads, sub-

divided into a great number of articles. An introduction of a hundred and fifteen pages, written by Condorcet, gave in detail the motives which had decided the commission. The convention accorded to the draught of our colleague the preference over all the others presented for its consideration from other quarters, and concluded that it would without delay be publicly discussed. Violent debates excited each day by personal enmity, the bitterness of party spirit; the wearisome difficulties of the circumstances, and the incessant usurpations of the commune of Paris absorbed all the time of the sessions. Condorcet, caring only for what he considered as directly promoting the triumph, the glory, and the happiness of France, grieved to see the consideration of the constitution day by day deferred. In his impatience he demanded a limit fixed for the delay, at the expiration of which a new convention should be called. At Paris the proposed constitution received very little attention; the departments, on the contrary, received it with favor. It carried and promoted ideas which had become so powerful that it was impolitic not to take them into account. Accordingly after the events of the 31st of May and the 2d of June, the part of the convention in the ascendency considered it opportune to gratify without delay the wish of the people for the constitution so long promised the country; but it refused to take up again the plan of Condorcet. Five commissioners, appointed by the committee of the public safety, at the head of which was Hérault de Séchelles, made a new plan which the committee amended and accepted in a single session. The convention was not less expeditious. The constitution presented on the 10th of June, 1793, was decreed on the 24th of the same month. The happy shouts of the populace and the thunder of cannon announced in Paris the great event.

The constitution, according to the terms of the decree, was to be sanctioned or rejected by the primary assemblies in the short space of three days from the time of notification, and here occurred an act of Condorcet in order to appreciate the bravery of which it is necessary to go back in thought to that terrible period in our annals which followed the 31st of May.

Sieyès, in private confidence, called the work of Hérault de Séchelles a bad index of subjects. What Sieyès said in secret Condorcet dared to write to his constituents. He did more: in a letter made public, the celebrated savant openly proposed to the people not to sanction the new constitution. His reasons were many and clearly expressed:

"The integrity of the national representation," said Condorcet, "has just been destroyed by the arrest of twenty-seven Girondin members. The discussion could no longer be free. Inquisitorial censure, the pillage of printing offices, the violation of the secrets of letters, must be considered as having presented insurmountable obstacles to the manifestation of the popular sentiment. The new constitution," added Condorcet, "as it speaks of no compensation for the deputies, leads to the supposition

that it is considered desirable to compose the national convention always of rich men or of those with good prospects for the future. The elections, too indirect, are a premium for intrigues and mediocrity. It is an insult to the people to suppose them incapable of making good immediate elections. To compose the executive power of twenty-four persons is to throw affairs into hopeless stagnation. A constitution which does not guarantee civil liberty is radically defective. There is in some minds a tendency toward federalism, toward the rupture of French unity, but the greatest mistake is to have rendered the means of reform illusory."

A critic so quick, so accurate, so just, moreover, could not have been welcome to the authors of the project, but what followed irritated them still more, for self-love is always the weak side of our species, even with those who call themselves statesmen.

"All that is good in the second project of a constitution is copied from the first,—which has only been perverted and corrupted by the attempt to correct and improve." Chabot denounced the letter of Condorcet to the convention in the session of the 8th of July, 1793. The ex-Capuchin called the new constitution of Hérault de Séchelles a *sublime work*. He spoke of the criticism as an *infamous* article which only villains could tolerate, and after the use of these abusive terms, adds: "Condorcet pretends that his constitution is better; that the primary assemblies ought to accept it. I propose, therefore, that he be placed under arrest, and compelled to plead his cause at the bar."

The assembly accordingly decreed without further accusation that the illustrious deputy from Aisne should be arrested and the state seal placed upon his papers.

Condorcet, although generally, but erroneously, considered a Girondist, was not among the number of the twenty-four deputies arrested on the 31st of May. On the 3d of October, 1793, however, his name is found with those of Brissot, Vergniaud, Gensonné, Valazé, in the list of the conventionals brought before the revolutionary tribunal, accused of conspiracy against the unity of the republic and condemned to death.

Condorcet, condemned as contumacious, was outlawed; was placed upon the list of exiles and all his possessions were confiscated.

"Honor took refuge in the camp." In this short sentence historians pretend to give an idea of the terrible years 1793 and 1794 of our revolution. But the great epochs of history can be described in so few words, only at the expense of truth. It is true the armies of the republic manifested a devotion, a patience, and a courage really admirable; it is true the soldiers, badly armed, badly clothed, barefooted, strangers to the most simple military evolutions, hardly knowing how to use their guns, overcame by force of patriotism the best troops of Europe, and drove them disorganized beyond the frontiers; yes, from the bosom of the people, whose intelligence had been dwarfed by the aristocratic pride and prejudices of our ancestors, sprang as if by enchantment immortal leaders; yes, when the welfare or honor of the country required

it, the son of an humble goat-herd became the illustrious head of one of our armies, the conqueror of Marshal Wurmser and the peace-maker of the Vendée; yes, the son of a simple tavern-keeper precipitated himself, like an avalanche from the heights of the Albis, and dispersed from under the walls of Zurich the Russian forces of Korsakoff, even at the moment when they considered themselves marching surely to the conquest of France; yes, the son of a plasterer with a few thousand men gave at Heliopolis such proofs of skill and of bravery that the phalanx of Macedonia and the legions of Cæsar can no longer be called the most valiant troops which have trodden the land of Egypt.

I deplore, I denounce, as vehemently as any one, the sanguinary acts which stained the years 1793 and 1794, but I cannot regard our glorious revolution only under this sad aspect. I find, on the contrary, much to admire, even amid the cruel scenes which marked the various stages of its progress. Can we cite, for instance, any country, ancient or modern, in which the victims of both sexes and all parties have given greater proof at the foot of the scaffold of resignation, of force of character, of ready sacrifice of life, than was manifested by our unfortunate compatriots? Nor should be forgotten the intrepid assiduity manifested by many honorable citizens in assisting and sheltering the proscribed.

This last reflection brings us back to Condorcet and the admirable woman who concealed him for more than nine months. It may be supposed that Condorcet did not fully measure all the gravity, all the importance, of the article which he published after the adoption of the constitution of the second year. This mistake, however, must be corrected. That which presented itself to the mind of the deputy of Aisne as a duty, he accomplished with full knowledge of the imminent danger incurred. As indisputable proof of this, I find that the publication of the *Address to the citizens of France upon the new constitution* coincides exactly with the steps taken to secure a place of refuge for the author.

In the political as in the terrestrial atmosphere, there are signs that herald storms, recognized at a glance by the experienced, however indefinite they may appear to others. Condorcet, his brother-in-law Cabanis, their common friend Vic-d'Azir, could not be deceived. After his public manifestation upon the subject of the constitution of the year II (of the Republic), the impeachment of Condorcet was inevitable; the thunder-bolt was launched at his head, and it was necessary for him to seek shelter without delay.

Two pupils of Cabanis and of Vic-d'Azir, who have since become distinguished members of this Academy, MM. Pinel and Boyer, suggested that he should resort for this purpose to No. 21 Servandoni street, where they had resided. This house, ordinarily occupied by students, belonged to the widow of Louis François Vernet, a sculptor and near relative of the great painters of that name. Madam Vernet, as well as her husband, was born in Provence. She had a warm heart, a lively imagination, a character open and frank; her benevolence amounted

to self-sacrifice. These qualities obviated the necessity of circumlocution and long negotiation. "Madam," said MM. Boyer and Pinel, "we wish to save a proscript." "Is he an honest man; is he virtuous?" "Yes, madam." "In that case, let him come!" "We will tell you his name." "You can tell me that later; lose not a moment; while we speak together, your friend may be arrested."

That same evening Condorcet intrusted his life to a woman whose existence even a few hours before was unknown to him.

Condorcet was not the first fugitive received at No. 21; one other had preceded him there. Madam Vernet never consented, in regard to this unknown, to satisfy the natural curiosity of the family of our confrère. Even in 1830, after nearly thirty-seven years had elapsed, her answers to the pressing questions of Madam O'Connor never passed beyond vague generalities. The refugee, she said, was a great enemy of the revolution; he lacked firmness, was frightened by the least noise in the street, and did not quit his retreat until after the 9th Thermidor. The excellent woman added, with a smile and some sadness, "Since that time I have not seen him; how do you suppose I can recollect his name."

Our confrère had hardly entered his retreat in Servandoni street, when he became a prey to the most cruel mental torture. His income was seized; he could not dispose of a straw belonging to him. For himself, personally, he did not suffer on this account, for Madam Vernet provided for his necessities; with this incomparable woman to assist an unfortunate was so much a matter of duty, that afterward, when the family of the illustrious secretary became opulent, they endeavored in vain, with repeated and constantly-renewed efforts, to induce her to receive some remuneration.

But, safe himself, "Where," thought the illustrious academician, "will she live who is so unfortunate as to bear my name to-day, when every noble woman, and much more every wife of a proscript, is excluded from the capital?" "Trust to the resources of a devoted wife." Madam Condorcet managed to come into Paris every morning with the purveyors of the markets. "But how will she support herself?" still demanded our confrère in his uneasy solicitude. It seemed, in fact, impossible that a lady delicately reared, accustomed to be served and not to serve others, could gain by her own exertions sufficient maintenance for herself, her young daughter, her sick sister, and an old housekeeper. But the apparently impossible was soon in fact accomplished. The need of some representation of the lineaments of relations and friends is never greater than during a revolution. Madam de Condorcet passed her days in making portraits now in the prisons, and these were the most in demand; now in the silent retreats the charitable secured for the proscribed; in the brilliant drawing-rooms, or in the modest habitations of citizens of all classes who considered themselves threatened by approaching danger. The skill of Madam Condorcet also rendered much less vexatious, much less perilous, the frequent raids of detachments of the revolutionary

army upon her dwelling-place of Auteuil. Upon the demand of the soldiers she reproduced their features with the pencil or the brush. She exercised over them the fascination of her talents, and almost converted them into protectors. As soon as painting ceased to be remunerative, Madam Condorcet, exempt from prejudices, did not hesitate to open a store for lingerie. Later she became the skilful translator of the work of Adam Smith upon the moral sentiments, and published, herself, some letters upon sympathy equally worthy of esteem on account of their delicacy of perception and their elegance of style.

The first steps, the first successes, of Madam Condorcet in the career of personal abnegation and courageous devotion we have just described were a balm to the almost fainting heart of the unhappy proscript. He felt himself inspired for persevering and laborious work. The force, the clearness of his mind were not less perfect in the retreat guarded by the heroic humanity of Madame Vernet than they were twenty years before, when he was secretary of the Academy of Sciences.

The first work written by Condorcet in his seclusion has never been printed. I will quote the opening lines:

"As I cannot know whether I shall survive the present crisis," writes the illustrious philosopher, "I consider it a duty to my wife, my child, and my friends, who may suffer from the calumnies attached to my memory, to give a simple exposition of my principles and my conduct during the revolution."

Cabanis and Garat were mistaken when they affirmed in the introduction to the *Sketch of the progress of the human mind* that their friend wrote only a few lines of this exposition. The manuscript consists of forty-one closely-written pages, and embraces nearly the whole of the public career of Condorcet. As secretary of the Academy of Moral and Political Sciences, I should perhaps transcribe the whole of this writing, in which the candor, the good faith, and the sincerity of our confrère are so brilliantly manifested; but the specialties of the Academy of Sciences exclude such details. Nevertheless, as it is the manifest duty not only for all academicians but all citizens to free our national history, our common patrimony, from the miserable stains the action of a limited party have impressed upon her, I will give the opinion of Condorcet in regard to the massacres of September:

"The massacres of the 2d of September," he writes, "a stain upon our revolution, were the work of the folly, the ferocity, of a few men, and not of the people, who endeavored not to see what they were unable to prevent. The factious party, few in number, to whom these deplorable events ought to be attributed, were artful enough to paralyze the public power, to deceive the citizens and the national assembly. They were resisted feebly and without system, because the true condition of affairs was not understood."

Is it not a pleasure, gentlemen, to find the people, the true people of Paris, exonerated from all responsibility in the odious butchery, by a

man whose enlightened understanding, patriotism, and high position are a triple guarantee of truthfulness? In future the following apostrophe of a workman to the commune will not stand alone as an isolated expression of individual opinion:

"You pretend to be destroying the enemies of the country. I do not call unarmed men such. Lead to the Champ de Mars these unfortunates who, as you say, would rejoice in the failure of the republic. Let us meet them equal in numbers, equal in arms, and there will then be nothing in their death to cause us to blush."

Condorcet bore his seclusion with great resignation until he heard of the tragical death of the Girondist conventionalists, who had been condemned on the same day as himself. This terrible circumstance concentrated all his thoughts upon the danger incurred by Madame Vernet. He had an interview with his brave protectress, which, although it seems like sacrilege, I give without changing a single word:

"Your kindnesses, madam, are engraved upon my heart with ineffaceable lines. The more I admire your courage, the more I feel it my duty as an honest man not to impose further upon it. The law is positive: if I am discovered in your dwelling, you will have the same sad end as myself. I am an outlaw; I cannot remain longer." "The convention, monsieur, has the right to put you beyond the amenities of the law, but has not the power to place you beyond those of humanity; you will remain."

This admirable answer was immediately followed by the organization in No. 21 Servandoni street of a system of surveillance to prevent the departure of the illustrious refugee, in which most of the members of the household, and particularly the humble porter, had a part. Madam Vernet inspired with her own virtue all those who surrounded her. From this day Condorcet did not make a movement which was not observed.

At this time occurred an incident which shows the superior intelligence of Madam Vernet, and her profound knowledge of the human heart.

One day as he was mounting the staircase leading to the chamber he occupied, Condorcet encountered the citizen Marcos, deputy solicitor to the convention for the department of Mont Blanc. Marcos belonged to the section of the mountaineers; he had been lodging for several days with Madam Vernet. Under his disguise, Condorcet had not been recognized; but was it possible to count upon this good fortune for any length of time? The illustrious proscript confided his uneasiness to his devoted hostess. "Wait," said she, "I will arrange this matter immediately." She ascended to the chamber of Marcos, and, without any preamble, addressed these words to him: "Citizen, Condorcet dwells under the same roof with yourself; if he is arrested it will be you who has denounced him; if he perishes it will be you who has caused his head to fall. You are a benevolent man; I have no need to say more." This

noble confidence was not betrayed. Marcos entered, even at the peril of his life, into direct relations with Condorcet. It was he who provided him with the romances which our confrère devoured in large numbers. Madam Vernet felt that through the restlessness of the prisoner, an accident might at any time betray him; that her efforts would in the end prove to be in vain if his mind were not more seriously occupied. At her instigation, Madam de Condorcet, and the friends of her husband, entreated him to devote his time to some important composition. Condorcet yielded to their counsel, and commenced his *Sketch of a historic picture of the progress of the human mind.*

While thus, through the judicious influence of Madam Vernet, Condorcet turned his scrutinizing gaze on the social condition of the past and future human race, he succeeded in diverting his thoughts completely from the terrible convulsions in which France was then struggling. In the *Sketch of the progress of the human mind* there is not a line in which the acrimony of the proscript has taken the place of the cool reason of the philosopher and the noble desire to promote the advance of civilization. "Everything tells us that we are on the eve of one of the great revolutions of the human race. * * * The present indications are that it will be a happy one." Thus Condorcet wrote when he was hopeless of escape from the active pursuit of his implacable persecutors; when the sword of death waited to fall only until the identity of the victim could be assured.

It was in the middle of March, 1794, that Condorcet wrote the last lines of his essay; to carry the work further without the aid of books was not in the power of any human mind. The work did not see the day until 1795, after the death of the author. The public received it with universal approbation. Two translations—one English, one German—made the *Sketch* very popular abroad. The convention obtained three thousand copies, which were distributed through the efforts of the committee of public instruction over the entire republic. In the autograph manuscript the work is called not a *sketch* but a *Programme of a historical picture of the progress of the human mind.* Condorcet indicates its object in the following terms:

"I intend to confine myself to the general traits which characterize the various phases through which the human race must pass, which sometimes manifest its progress, sometimes its decadence, which betray causes and show their effects. * * * It is not the science of man in general that I undertake to treat; I wish to show solely how, through time and his own efforts, he has been able to enrich his mind with new truths, to perfect his intelligence, to extend the use of his faculties, and to employ them to better advantage for his own happiness and the common good."

The work of Condorcet is too well known to require analysis here. How, moreover, can a *programme* be analyzed? I will merely draw the

attention of unprejudiced minds to the curious chapter where, dwelling upon the future progress of the human mind, the author shows the necessity, the justice (these are his expressions) of establishing an entire equality of civil and political rights between the individuals of the two sexes, and proclaims, besides, the indefinite perfectibility of the human race.

The latter philosophical idea was opposed with extreme violence in the beginning of this century by all the popular writers. According to them the doctrine of indefinite perfectibility is not only untrue, but productive of disastrous consequences. The *Journal des Débats* presented it "as favoring too much the projects of the seditious." In the severe criticism made of it in the *Mercure*, in reference to a work of Madam de Staël, Fontanes flattering the passions of Napoleon, even maintained this dream of perfectibility to be a terrible menace to governments. Finally, to weaken (according to the ideas of the day) the rights of this philosophical doctrine to any serious consideration, it was pretended that Voltaire was its first, its true originator. This assertion, however, could not well be sustained. The idea of perfectibility is in fact found in Bacon, in Pascal, in Descartes. Nowhere, however, is it more clearly expressed than in this passage from Bossuet: "After six thousand years of observation the human mind is not yet exhausted; it investigates, it discovers still, and may do so to infinity; idleness alone can limit its knowledge and its inventions."

The merit of Condorcet in regard to this particular subject is confined to having studied by means of data furnished through modern science, and by ingenious association of the facts obtained, the hypothesis of an indefinite perfectibility relative to the duration of the life of man, and his intellectual faculties. But he was, I believe, the first to extend the system so as to induce the hope of the indefinite perfection of the moral faculties. Thus I read in his work "that a day will come when our interests and our passions will have no more influence upon the judgments which control the will than they have now upon scientific opinions." Here, without entirely differing from the author, I would say he makes a prediction it will require a long time to fulfil.

The programme was originally intended to have been followed by a *Tableau complet* (a complete picture) of the progress of the human mind. This picture, composed principally of facts, of historical documents, and of dates, was not finished. The editors of 1804 published some fragments of it; other portions are found in the papers of M. and Mme. O'Connor. Let us hope that filial piety will favor the public with the rest. I dare to hope that it will establish the judgment given by Daunon of the sketch: "I do not know any one, however erudite, either of this or any other nation, who deprived as Condorcet was of books, and with no other guide than his memory, could have composed such a work."

As soon as the fever of authorship of our confrère was abated, his fears

of the danger incurred by Madam Vernet by his presence in Servandoni street were renewed. He then, to use his own words, resolved to quit a retreat which the unlimited devotion of his tutelary saint had transformed into a paradise.

Condorcet was so well assured of the probable consequence of the step he was about to take, the chances of safety appeared to him so slight, that before leaving the protection of Madam Vernet he recorded his last wishes. This document, which I have in my hands, manifests throughout an elevated mind, a feeling heart, and a beautiful soul. I dare even to say that in no language can there be found anything more thoughtful, more touching, more graceful in form than some passages in this testament, the last effort of our confrère, which he called *The advice of a proscript to his daughter*. I regret that time does not permit me to make some quotations from it. These lines, so clear, so full of delicate and natural feeling, were written by Condorcet on the very day when he was about to expose himself to great danger. The feeling that a violent death was almost inevitable did not disturb him; his hand traced these terrible expressions, *my death*, *my approaching death*, with a firmness the stoics of antiquity might have envied. Sensibility, on the contrary, overcame his strength of mind when the illustrious proscript considered that Madam de Condorcet might be included in the violent death which threatened him. When obliged to mention this terrible contingency, he no longer speaks directly to the point, but endeavors, if we may so say, to veil from his own eyes the horrors of the situation by ambiguous expressions—"If my daughter is destined to lose both parents." This is the most explicit reference he makes to the subject in all the writing; and then, as if even this was too much for him, he immediately reverts to the support of his child, then only five years old. He hopes that his dear Eliza will remain with his benefactress. He foresees and provides for everything. Eliza will call Madame Vernet her second mother; she will learn, under the direction of this excellent friend, besides the usual occupations of woman, how to design, paint, and engrave sufficiently well to gain a living. In case of necessity, she might apply for assistance in England to Lord Stanhope, and Lord Dean; in America, to Bache, grandson of Franklin, and to Jefferson. She should therefore be taught the English language; this, moreover, was the wish of her mother, which was, in itself, enough. At the proper time, Madam Vernet will cause to be read to Mademoiselle Condorcet the instructions of her parents from the original manuscript (this circumstance is especially indicated). Eliza must be kept free from any desire for revenge, must be taught to overcome what would naturally be, under the circumstances, her filial tendencies in this respect. This was a sacrifice demanded of her in the name of her father. The will terminates with these lines: "I say nothing of my feelings toward the generous friend (Madam Vernet) for whom this document is intended;

let her put herself in my place, then question her own heart, and she will know them all."

Thus Condorcet wrote, on the morning of the 5th of April, 1794. At ten o'clock he left his room in his usual disguise, a vest and large cap, of wool, and descended to a small apartment on the ground floor, hoping to elude the surveillance of which he was the object, and make his escape; but finding Madam Vernet there, he entered into conversation with another inmate of the house* who was present, interlarding his discourse with Latin phrases and making it in every way as tedious and uninteresting as possible, in order to drive her from the room, but in vain. The proscript was in despair, when, by chance or by calculation, he manifested annoyance at having forgotten his snuff-box. Madam Vernet, always kind, hastened to mount the stairs in order to look for it. Condorcet seized this moment to rush into the street. The distressed cries of the portress immediately informed Madame Vernet what had happened, and that she had lost the fruit of nine months' unexampled devotion; the poor woman fell back fainting. To avoid a pursuit, which would have ruined his benefactress, Condorcet passed rapidly through Servandoni street. Stopping to take breath, as he turned into the street Vaugirard, he saw at his side M. Sarret, the cousin of Madame Vernet. The proscript had hardly time to utter some words of farewell, in which admiration was mingled with affectionate gratitude, when M. Sarret said to him, with a firmness that admitted of no resistance, "The costume you wear does not disguise you sufficiently; you do not know your road; alone you will never succeed in escaping the active surveillance of the argus-eyed sentinels the commune has placed at all the gates of Paris. I have therefore determined not to leave you."

It was at ten o'clock in the morning, in broad sunlight, in a frequented street, at the door even of the terrible prisons of Luxembourg and of Carmes, out of which none ever came, except to go to the scaffold; it was in full view of lugubrious notices, declaring in large characters that the punishment of death would be inflicted upon any one who rendered assistance to the proscripts that M. Sarret attached himself to our proscript. Was not this intrepidity equal at least to that of a body of soldiers who throw themselves upon the thundering artillery of a redoubt? The two fugitives escaped by a sort of miracle the dangers which attended them at the barrier of Maine, and then directed their steps toward Fontenay-aux-Roses. The journey was long, after nine months of absolute inactivity had unfitted our confrère for walking. At last, about three o'clock in the afternoon, Condorcet and his companion arrived without mishap, but extremely fatigued, at the door of a country house, occupied by a happy family, who for nearly twenty years had received from Condorcet distinguished services and marks of favor without number. There ended

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* This man was named Sarret; was an author of several works. He had married Madame Vernet, but the marriage was kept secret, as the lady did not wish to give up her maiden name.

the dangerous mission Sarret had undertaken; he left Condorcet and returned to Paris.

What happened then, accounts do not agree. As far as I can learn, Condorcet solicited hospitality only for a single night. Certain difficulties, of which I will not make myself the judge, prevented his friends from granting his request; nevertheless they arranged that a small garden door opening outward toward the country should not be closed at night, and that Condorcet might present himself there at ten o'clock. When taking leave of the unfortunate proscript, they presented him with the Epistles of Horace, a poor resource in truth for one obliged to seek a refuge in the dreary darkness of the quarries of Clamast. These old friends of Condorcet undoubtedly committed the irreparable fault of delegating to others, and not seeing themselves that the arrangement made was carried out. For one or two days afterward Madam Vernet who passed over the country of Fontenay-aux-Roses in every direction, in the hope that her presence there might be useful to the fugitive, remarked a mound of earth and tuft of grass in front of the little gate, proving, alas, only too well, that for a long time it had not turned on its hinges; during two dreary nights no door had been open for him, except in Servandoni street. There at No. 21 during a whole week front door, shop door, or alley-door would have yielded to the slightest pressure of the fugitive's finger. In the possibility, I can hardly say the hope of a nocturnal return, Madam Vernet did not think of the thieves and assassins who at that time especially haunted Paris. Great, alas, was the difference in conduct of the two families, with whom ties formed in prosperity by favors conferred and ties of misfortune had connected Condorcet.

On the 5th of April, at two o'clock, we see Condorcet leaving with resignation, but not without sadness, the country house where he had hoped to pass twenty-four hours in security. No one will ever know the anguish, the sufferings he endured throughout the 6th. On the 7th we see him, wounded in limb and impelled by hunger, enter an eating-house of Clamart, and ask for an omelette. Unfortunately this man, of almost universal information, did not know even approximately how many eggs a workman eats at a repast. When asked by the shopman how many he desired, he answered a dozen. This unusual number excited surprise, soon suspicion, which spread quickly. The stranger was requested to exhibit his passport; he had none. Pressed by questions, he called himself a carpenter, but the state of his hands contradicted the assertion. The municipal authorities were informed, had him arrested, and sent him to Bourg-la-Reine. On the route a kind vine-dresser meeting the prisoner, seeing his wounded limb and his limping walk, generously lent him his horse. I ought not to pass over this last mark of sympathy received by our unfortunate confrère.

On the 8th of April (1794), in the morning, when the jailer of Bourg la Reine opened the door of the dungeon in which the unknown prisoner

had been confined, in order that the *gendarmes* might conduct him to Paris, he found only a corpse. Our confrère had escaped the scaffold by a dose of concentrated poison he had for sometime carried in a ring.*

Bochard de Saron, Lavoisier, La Rochefoucauld, Malesherbes, Bailly. Condorcet—such were the losses sustained by the Academy during our sanguinary struggles. The memories of these illustrious men have fared very differently; some have rested in peace in the universal and well-deserved regret; others have periodically been subjected to the storm of political abuse.

If my powers obey my will, I hope soon in this place to speak to you of Bailly. To-day I shall not feel that I have accomplished my sacred task, even after all that has been said, if I do not free the memory of Condorcet from a calumnious imputation. The form of this accusation against our brother does not lessen my inquietude; it imputes to him only weakness, but weakness under some circumstances is a crime.

In giving an account of the deplorable condemnation of Lavoisier, a pen very wise, very respectable, and very respected, wrote some years ago: "Much hope was felt for Lavoisier on account of certain circumstances some of his confrères could adduce in his favor; but terror froze their hearts." With this as foundation, a certain public, cruelly trifling, numbered upon their fingers the academicians who had seats in the convention, and so, without further examination, the name of our former secretary is found fatally implicated in the stupidly ferocious act which deprived France of an excellent citizen, the world of a man of genius. Two dates, two simple dates, will show that when no names are mentioned in connection with so grave an event, when only general terms are used and no one is especially accused, it is not wise, to say the least, to implicate everybody.

Condorcet, it has been said, might have interfered in favor of Lavoisier. When?—at the time of the arrest? Then this is my answer: Lavoisier was arrested in the month of April, 1794. Condorcet was proscribed and hidden with Madam Vernet from the commencement of July, 1793. After the sentence of the revolutionary tribunal? The response is still more decisive: Lavoisier died on the 8th of May, 1794. Condorcet poisoned himself at Bourg la Reine a month before, on the 8th of April. I need not add a word to these figures; they will remain imprinted by ineffaceable lines upon the foreheads of the calumniators of our noble confrère.

PORTRAIT OF CONDORCET.

I have successively presented to your eyes, and in what has appeared to me the true light, the savant, the literateur, the political economist, and the member of two of our national assemblies. It remains for me to

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* This poison (we do not know its nature), was prepared by Cabanis. That with which Napoleon attempted to poison himself at Fontainebleau was of the same origin and the same date.

give the portrait of the man of society, to speak of his exterior appearance and of his manners. At one time I was in despair of fulfilling this part of my task, for I had not known personally the secretary of the Academy. I had never even seen him. I knew too well, besides, that books are very unfaithful guides to a knowledge of their writers; that authors can assume sometimes in their works a character totally at variance with their habitual actions. The maxim of Buffon had often been contradicted by fact: "A man's style is the man himself." Happily, unpublished correspondence has in a manner transferred me into the family of Condorcet; has shown him to me surrounded by his relations, his friends, his confrères, his subordinates, and his clients; has made me the witness, the confidant, I had almost said, of all his actions. So I feel reassured. Need I fear to speak with boldness of the most secret thoughts of the illustrious academician, of his private life, of his most sacred feelings, when I have for guides and references Turgot, Voltaire, d'Alembert, Lagrange, and a woman (Mademoiselle de L'Espinasse) celebrated by the extent, the penetration, and the delicacy of her mind?

Condorcet was of large stature; the immense size of his head, his large shoulders, his robust body, contrasted with limbs which had always remained slight on account, our brother thought, of the inactivity which his costume of a girl, and the too great solicitude of his mother, imposed upon him during the first eight years of his life.

Condorcet always retained, with great simplicity, something approaching to awkwardness. To see him only in passing, it would have been said, That is a good man, rather than, That is a wise man. His principal trait, his truly characteristic quality, was an extreme kindness, which was in accordance with the gentle expression of a beautiful face.

Condorcet was considered by his mere acquaintances as cold and insensible. This was a great mistake. He never, perhaps, addressed affectionate expressions to his relatives and friends; but he never lost an opportunity of giving active proof of his attachment. He was afflicted with their afflictions; he suffered from their misfortunes to such a degree that his sleep was often disturbed and his health affected.

How does it happen, then, that our confrère has been so frequently accused of insensibility? Because the emotions of his noble soul were not manifested readily in his countenance. He would listen with an air of the utmost indifference to the story of an unfortunate; but while others were content to manifest their sympathy in vain words, he, without saying anything, would bring succor and consolation of all kinds to relieve the sufferings which had been revealed to him. You know now the true meaning of the words of d'Alembert, "Condorcet is a volcano covered with snow." It is a great mistake to suppose the immortal geometer, by his picturesque simile, meant to indicate violence of character, disguised by coldness.

D'Alembert had seen the volcano in full action in the year 1771. The geometer, the metaphysician, the political economist, the philosopher,

Condorcet, entirely overwhelmed by an affair of the heart, had then become for all his acquaintances an object of pity. He even thought of committing suicide. The manner in which he rejected the palliative for his grief, recommended by his friend and confidant, Turgot, is interesting: "Make some verses; it is a kind of composition you are unaccustomed to, and will distract your mind." "I do not like bad verses; I could not endure my own." "Attack some deep problem of geometry." "When a depraved taste has supplied us with aliment of strong flavor, all other food is displeasing to us. The passions are a degradation of the intellect; outside of the feeling which absorbs me, nothing in the world interests me." As a physician tries all remedies in desperate cases, Turgot then endeavored to excite the fortitude of his friend by examples taken from ancient and modern history and even mythology, but all in vain; time alone could cure, time alone did cure, in fact, the wound which rendered our confrère so unhappy.

If the public were wrong in accusing Condorcet of insensibility, they were equally mistaken in considering him indifferent in matters of art.

When at the French Academy was read for the first time one of those literary productions which formed the glory and the honor of the eighteenth century, Condorcet would remain completely impassive in the midst of the most enthusiastic manifestations of admiration for the author, would hardly seem to have listened, but as soon as opportunity offered he would analyze minutely the work, appreciating its beauties and indicating the weak portions with tact and delicacy as well as admirable judgment, while in support of his remarks he would recite without hesitation long quotations in prose or verse which had become engraved upon his most remarkable memory.

The reserve Condorcet imposed upon himself before strangers gave place in social intercourse to a gayety, simple, refined, and slightly epigrammatic in expression. It was then the immense variety of his knowledge was revealed. He spoke with equal clearness, equal assurance of the rules of geometry, and the regulations of the palace; of philosophy and the genealogy of the court people; of the customs of the republics of antiquity, and the trifles of society.

The secretary of the ancient Academy of Sciences descended into the polemic arena only to defend his friends against the attacks of mediocrity, of hate, and of envy. But his courageous devotion did not lead him to share the unjust prejudices even of those to whom he was most tenderly attached. This kind of independence is so rare I must give some examples of it.

D'Alembert, unconsciously influenced by a feeling of jealousy, did not render full justice to Clairaut. Yet we find Condorcet, in his eulogies of M. de Trudaine and of M. d'Arci, referring almost unnecessarily to the relations of these savans with the author of the beautiful work upon the figure of the earth, while he does not hesitate to call Clairaut a man of genius and to speak of the wonders he accomplished in his youth.

Lagrange and d'Alembert had a very low opinion of the *Lettres d'Euler à une Princesse d'Allemagne.* They had even gone so far as to call them, in allusion to a feeble work written by Newton in his old age, "the commentary upon the apocalypse of Euler"; Condorcet regarding them from another point of view found the letters useful, and not content with praising them, became the editor of them, without the slightest suspicion that this independence of opinion might cause umbrage to his best friends.

The book of Helvétius had irritated Turgot, who expressed himself very emphatically about it, in his correspondence. Upon this point the celebrated intendant of Limoges was impatient of contradiction. Condorcet nevertheless maintained his own opinion of the work with great firmness; he was far from considering it irreproachable, but thought that its dangerous tendencies were exaggerated.

Vanity reigns supreme in all classes of society, particularly, it is said, among men of letters. We can nevertheless affirm that this active and universal stimulant of our actions never affected the beautiful soul of our former confrère. A number of circumstances give evidence of this rare phenomenon. Jealousy is the just punishment of vanity; yet Condorcet never experienced this cruel infirmity. When absorbed by his arduous duties as secretary of the Academy, and by his literary and political engagements, our confrère was obliged to renounce the great and pure pleasure of scientific discoveries; he nevertheless wrote to Euler, to Lagrange, to Lambert (d'Alembert was sick at that time), "Give me news of your work; I am like one of those old gourmands, who, unable longer to digest, still take pleasure in seeing others eat."

Condorcet carried so far his desire to be useful that his door was never closed against any one; he was always accessible; he received every day without impatience, without even appearing to be fatigued, the interminable visits of the legions of troublesome and idle fellows who abound in all great cities, especially Paris. Considering the value of his time, this was kindness carried to heroism. As to Condorcet's disinterestedness, I need not speak of it, as it is well known. "In ethics," he wrote in a letter to Turgot, "I am an enemy to indifference and a friend of indulgence." The phrase would not represent the truth if taken in an absolute sense. Condorcet was very indulgent toward others but very severe with himself. He was very independent in action, so much so as to injure himself seriously by considering certain forms of politeness, current in society, as species of small change too trifling to be taken into account. As an example of his disregard of popular opinion, especially where a principle was concerned, I give the following incident: M. de Maurepas was very much irritated by a letter directed against Necker, and in which occurred some passages which could be injurious to the public credit. It was wrongfully attributed to Condorcet. The Duke de Nivernais endeavored to persuade his friend and confrere to write to the minister, but he resisted with a firmness which, at the time,

seemed inexplicable. To-day I find the explanation in an unpublished letter addressed to Turgot. The secretary of the Academy would not pay even the semblance of respect to a man whom he was far from respecting.

Condorcet acknowledged his faults and the errors he committed with a frankness of which the following brief incident is an example: "Do you know," said some one to him, "the circumstances which caused the rupture between Jean Jacques and Diderot?" "No," he answered, "I only know that Diderot is an excellent man, and whoever involved him in dissension was wrong!" "But it was yourself?" "Then I was wrong!"

In the edition of Pascal's thoughts, by the author of Mérope, I find this note of Condorcet: "The expression, 'honest men,' signified originally men of probity; in the time of Pascal, it indicated men of good society; now it is applied to men of title or of money." "No," said Voltaire, addressing himself to the annotator, "the honest men are those at whose head you stand."

To justify this exclamation, since it seemed to me the expression of truth, has been my object in writing these pages. I shall be happy if the portrait I have traced of the illustrious perpetual secretary of the ancient Academy of Sciences has dissipated the very cruel prejudices, neutralized the effects of the more detestable calumnies which have injured his memory; if, with those who enjoyed the intimacy of Condorcet, I have made you see in him a man who has honored science by his labors, France by his high qualities, humanity by his virtues.

LOUIS AGASSIZ:

A BIOGRAPHICAL NOTICE.

By Ernest Favre.

[Translated for the Smithsonian Institution* by M. A. Henry.]

The name of Agassiz, for twenty years intimately connected with the history of science in America, has nevertheless retained its popularity in Switzerland, where his works have a great celebrity. It is in our country that he was born, in our country he acquired renown, and Switzerland can never forget that he is among the number of her children. Without other resource than his intelligence and his energy, he rose to the first rank among the eminent men of science of our country. We desire in these few pages, as a souvenir of this great scientist, to notice briefly the various phases of his life and the principal subjects of investigation he pursued.†

I.

Louis Jean Rodolphe Agassiz was born on the 28th of May, 1807, in the rectory of the village of Motier, situated in the canton of Friburg, on the shore of Lake Morat. Nothing in his family nor in his surroundings gave promise of the brilliant destiny which awaited him. His ancestors had filled the office of pastor for six generations; his father, deprived of fortune, had embraced the hereditary occupation. It was then entirely to his own energy, his talents, and his genius that he owed the high position he afterward attained.

There is little to be said of his early years. From his infancy the observation of animals was one of his greatest pleasures. He passed many hours fishing in the lake and in studying the habits of fishes; he watched with interest the metamorphoses of the caterpillar. The same taste was manifested both at Bienne, where he pursued his studies in the college, and at Orbe, where he resided later, by his passion for collecting insects and plants, and he was often heard explaining with enthusiasm to his younger brother phenomena of nature he as yet but imperfectly under-

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*From the "Archives des Sciences de la Bibliothèque Universelle, Genève, Mai 1877, tome LXIX."

†In the "Catalogue of Scientific Papers," published by the Royal Society of London, is found a list of 130 publications made by Agassiz. This list includes only articles which have appeared in scientific periodicals. To it must therefore be added all his various works published separately, as well as his numerous contributions since the year 1863, at which date the above catalogue terminated.

stood. The course of the Academy of Lausanne afterward turned his attention toward classical studies.

When he arrived at the age to choose a profession his parents desired to procure for him a commercial apprenticeship, but he obtained instead permission from them to pursue the study of medicine, which could give him both the means of providing for his support and the opportunity of continuing the study of natural history, for which he felt a decided vocation. He passed two years at Zurich, then a winter at Heidelberg, where Bischoff, Leuckardt, and Tiedemann were professors. While at this university fishes were still one of his favorite studies. He already began to classify them and to make drawings of them, and thus accumulated material which later was of great service to him.

In the autumn of 1826 he went to Munich, where the chairs of natural history were occupied by men of the first rank. Oken Martius received him with kindness; Dœllinger, the illustrious professor of embryology, took him under his protection, made him a member of his household, and developed in him a taste for this science, to which Agassiz always attached great importance. At this time the young student had already excited great anticipations for his future; soon his masters and comrades, among whom we find the botanists Schimper, and Braun, and Burckhardt, his draftsman, were his friends, and he became the center of an eager group of scientists. "When we assembled," he wrote, "for conversation, or to give each other lectures, as was frequently our custom, our professors were often among our auditors, and encouraged us in our efforts for individual research. My room was the place of meeting—bedroom, work-room, museum, library, lecture-room, and fencing school, all in one. Students and professors called it the Little Academy."

The four years he passed thus at Munich in the study of medicine, of the natural sciences, and even of philosophy, with all the hope, the enthusiasm of youth, were among the happiest of his life, and he always cherished a pleasant recollection of them; moreover, it was during this period that his future career was definitely decided. Martius and Spix had only a short time before returned from an expedition to the river Amazon, and Spix had since died, having only commenced the description of the fishes collected. Martius requested Agassiz, somewhat prepared for the subject by his own studies, to take charge of the work. The young student acquitted himself of his difficult task with honor, and this was the commencement of his reputation. The work appeared in 1829.* The same year Agassiz received the doctorate of philosophy. The following year he was admitted to practice as doctor of medicine, and went to Vienna in order to study, in the collections of that city, the fishes of the Danube.

He was recalled to Switzerland by his father, who demanded that he should return there and practice medicine; but he succeeded in obtain-

*Selecta genera et species piscium quos collegit et pingendos curavit, Dr. I.-B. de Spix; digessit, descripsit et observationibus illustravit, Dr. L. Agassiz.

ing a delay, and after a brief sojourn in Vienna went to Paris, where he conceived a strong desire to bring himself into relation with the pleiades of celebrities of the Museum of Natural History. Cuvier, Blainville, Valenciennes received very kindly the young doctor. He saw frequently Humboldt, who was then in the height of his renown, and who gave him substantial proof of his friendship by furnishing him the means of prolonging his stay in Paris.*

The interest felt by Agassiz in the investigation of fishes increased with his knowledge of the subject. He found in Paris one of the most complete collections, and a beautiful series of fossil fishes from Monte Bolca belonging to Count Gazzola. He undertook the description of the latter. This was his first step in paleontological research. Cuvier, who soon observed in the young naturalist signs of rare ability, placed generously at his disposal material collected for a history of fossil fishes, and this influential encouragement decided his career.

Zoölogy alone did not satisfy his powers of generalization, and he soon recognized that paleontology was its indispensable complement. The division of the animal kingdom into branches, classes, orders, families, genera, and species, was not in his opinion merely a system, invented to simplify research, but a divine institution; according to his view, this great plan of creation existed from the beginning, and the organisms now found upon the surface of the globe form a part of it as well as those whose remains are found in the most ancient deposits. The nature of fossils, the entire system of their organization, prove in the most conclusive manner the existence of this primitive plan, which has developed regularly up to the present period. Paleontology furnishes thousands of species, of genera, and even of numerous families, which to-day have entirely disappeared, and which constitute an important part of this great plan. To base a zoölogical classification upon living organisms is to make a whole of a small part, is to eliminate arbitrarily from the divine system the majority of the elements of which it is composed. The great work of Cuvier had suddenly revealed the importance of paleontology. In his investigation of fossil bones he laid the foundation of this science, by showing that the species found below the surface of the globe are different from those living at the present time. He had established the laws of the *unity of plan* which allowed the conception of ancient from existing forms; and the law of *concordance of characters*, which, establishing the necessity that all parts of an organism are disposed for the same end, authorized the deduction from each of them of the character of the other parts, as well as of the kind of life of the animal.†

To understand an extinct type we do not need to have it entire under our eyes. The solid parts (which are alone preserved) not only give us sufficient characteristics to class it in the genus and the species to which

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*Letters of Agassiz to Louis Coulon, Mem. Soc. Phys., Genève, 1874, XXIII, 472.

†Pictet, Traité de Paléontologie. Introduction.

it belongs, but a mere fragment of this frame-work, a single bone, a jaw, a tooth is in most cases enough for this purpose.

These principles are based, above all, upon the comparative anatomy of living animals, the study of which is indispensable to a knowledge of extinct types. Agassiz applied them to that of fossil fishes, the collections of which contained at that time many specimens which had not yet been examined. The public and private museums of England furnished most of the material for his investigations, but those of the continent were also made to contribute.

II.

Hitherto we have seen Agassiz utilizing for the profit of science the great resources placed at his disposal. His return to Switzerland, in 1832, makes us acquainted with a new attribute of his great mind, the talent for creation and organization. The liberal encouragement of Louis Coulon, and among others that of Humboldt, who exercised a great influence over the King of Prussia, then suzerain of Neuchâtel, facilitated the establishment of Agassiz in that city. An annual compensation of 80 louis as professor at the gymnasium, and the sale of his collections for 500 louis, provided the first resources necessary for the continuation of his publications. He had not here, as at Munich and Paris, immense stores of material at his command and illustrious men of science to come to his aid. Everything was in an unformed condition; but he was the pioneer, the chief, and he soon rallied about him a group of naturalists, who recalled upon another theater the "Little Academy" of Munich. The well-known names, Desor, C. Vogt, Gressly, Guyot, Nicolet, of Montmollin, are connected with this period of his life; the first two were his most active collaborators. Several of his fellow-students of Munich—Weber, Dinkel, and Burckhardt—followed him to this new residence, where they labored in the execution of his designs; one of them, a citizen of Neuchâtel, H. Nicolet, opened at his instigation a vast lithographic establishment, where all the plates of his memoirs were executed. The modest chair he occupied became soon the most distinguished of the gymnasium; the collections increased rapidly; the public became interested; a few young men entered into these researches; and thus was founded, in 1833, under the presidency of L. Coulon, the Society of Natural History, of which Agassiz was the secretary and the *soul* for many years. Neuchâtel became an important scientific centre; thence proceeded successively and at short intervals voluminous scientific publications of the first order.

In 1839 he published the commencement of his *Histoire naturelle des Poissons d'eau douce de l'Europe centrale*, which contains the embryology of the Salmonides by C. Vogt. This work, undertaken on a very extensive plan, was never completed.

The history of fossil fishes, begun at Paris, was terminated at this period. The first part appeared in 1833, at his own expense, but his

modest resources were not sufficient to continue the work, as it was accompanied by expensive plates.* The Geological Society of London, aided by Lord Enniskillen and Sir Francis Egerton, furnished the means he lacked. A draftsman, Denkel, worked for him constantly for several years. This publication, which may be regarded as a continuation of Cuvier's Researches upon fossil bones, was not finished until 1843. It is the most original work of Agassiz, and one of the principal monuments of his greatness.

There is no class of animals that can furnish elements more important for the history of the development of the organic kingdom, the law of the succession of beings, and the relations of the fossil fauna than the fishes. They alone of the vertebrates appeared in the first ages of the world, and passed through all the phases of creation up to the present time.

An osteology of fishes, a rational classification, the description of a multitude of new species, and theoretic consequences of great importance were the results of the wise researches of Agassiz.

One of the distinctive characteristics of this class of animals is a skin covered with scales of peculiar form and structure; now the nature of this envelope is in direct accordance with the interior organization. The scales, therefore, from this point of view, are of great importance, and may serve as a basis of classification. The author subdivides them into four orders, as follows:

Cycloids.—Scales imbricated, corneous, and without enamel, the posterior edge simple. Skeleton bony.

Ctenoids.—Scales imbricated, corneous, without enamel, the posterior edge indented. Skeleton bony.

Ganoids.—Scales angular, and covered with a layer of enamel, their edges uniting regularly. Skeleton less bony than the preceding, sometimes cartilaginous.

Placoids.—Osseous plates, disposed irregularly, terminated on the upper side by points or hooks. Skeleton cartilaginous.

The last two orders have existed from the first appearance of life upon the surface of the globe. The others commenced with the Cretaceous period, and include most of the fishes of the present time. This classification has since undergone important modifications; it however assisted very considerably progress in the knowledge of this class. The hand of genius, said Pictet, is everywhere manifest throughout this beautiful work.

The monograph of the fishes of the old red sandstone, undertaken at the request of the British Association for the Advancement of Science, and completed in 1844, supplemented the preceding work.† The author

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* *Recherches sur les Poissons fossiles;* 5 volumes quarto, with an atlas of 384 plates, in folio, most of the figures being colored.

† *Supplément aux recherches sur les Poissons fossiles. Monographie des poissons fossiles du vieux grès rouge ou système dévonien des îles Britanniques et de Russie.* 4to. 41 pl. 1844–1845.

was obliged to describe a very numerous and entirely new fauna. When he commenced his investigation of fishes, he was not acquainted with any species older than those of the coal strata; the number of these fossils has immeasurably increased since then, and is now counted by thousands. Agassiz recognized that among the living species a small number only have a heterocercal tail; that is to say, one in which the upper lobe is formed by the prolongation of the vertebral column. These animals are the last representatives of a type largely diffused in the Devonian and Carboniferous seas. All the other fishes, on the contrary, have a homocercal or symmetrical tail, at the base of which the vertebral column stops, and does not penetrate either of the lobes. He observed that in the embryo of certain fishes the tail is at first heterocercal, as that of the paleozic fishes, and afterward becomes homocercal. This important discovery, in connection with others of a like nature, permitted him to establish the law that the "embryo of the fish during its development, the present class of fishes with its numerous families, and the type of fish in its geological history, undergo strictly analogous phases," and in a more general way he applies this law to vertebrates; "The successive creations have undergone phases of development analogous to those the embryo passes through during its growth, and similar to the gradations the present creation shows us in its ascending series, considered as a whole." Then rising from the consideration of the fishes to more general views of the phases of creation, he writes: "The most incontestable result of modern paleontological research, in the examination of the question which at present occupies us, is the fact, now beyond controversy, of the simultaneous appearance of particular types of all classes of invertebrate animals from the earliest development of life upon the surface of the globe." The history of this successive development "shows conclusively the impossibility of referring the first inhabitants of the earth to a small number of branches, differentiated from one parent stock by the influence of the modifications of exterior conditions of existence."*

It was in 1844 that Agassiz wrote these lines, and he all his life remained faithful to this opinion. The future will decide whether he was right or wrong; it is true that for the moment the balance does not seem to lie in his favor. It is difficult, indeed, to comprehend why the results of these admirable researches, and of those he made later, did not lead him to sustain the theory of transformation of which they seem to be the natural consequence. Still it is impossible to consider his opposition to this theory as resulting from prejudice, or as resting upon other grounds than pure scientific reason.

Agassiz had a mind too comprehensive, he was too enterprising, to confine his attention to a single class of the animal kingdom, and we find him soon producing a series of works upon a variety of subjects. Thus he undertook, with M. Desor, the study of the Echinoderms; and their

* Introduction to a monograph of the fossil fishes of the old red sandstone, pp. 4, 13.

researches formed the basis of the ulterior investigations of this class. Mr. Desor soon made a specialty of the subject, and to him we owe the publication of several works in the preparation of which Agassiz was only his collaborator. Agassiz also pursued some investigations, as new as they were original, on living and fossil mollusca.*

A large number of articles upon special points of natural history and memoirs containing more general conclusions, succeeded each other rapidly during these years. While these original memoirs exhibited the scientific genius of their author, his numerous lectures, the fruits of his vast erudition, formed the substance of various other works.

One of the principal of these is a catalogue of the genera of all known animals, a work to which several of the most distinguished geologists of that period contributed. At the same time he collected the elements of a zoölogical and geological dictionary published later in London. †

"We have a good working force," he writes to a friend in Geneva; "Gressly is here. Desor is studying the Galerites. I am busy, alternately, with Myas and the fresh-water fishes. Vogt with anatomy. Thus the time passes agreeably and usefully."

The energy he displayed during these years was something astonishing; the history of science presents no other example like it. One of his collaborators gives us a vivid picture of the activity which reigned in the laboratories of Neuchâtel. "It might be supposed," said Mr. Vogt, "that in such complicated machinery the wheels would sometimes have interfered with each other. The printing-office constantly demanded copy, the lithographic establishment designs, and yet the work of his original researches never ceased; hardly had we the time necessary to complete one set of labors before Agassiz had new plans and assumed new tasks. Every thought that passed through his head was converted into a great work, with hundreds of folio plates, hundreds of pages of text; in all this he was the acknowledged master, as well as in the collection of new material for his work. He knew how to draw all Europe into contribution. Often boxes which had been sent for and awaited with feverish impatience remained weeks and even months unopened, because in the meanwhile another subject occupied attention, and the objects they contained had lost their interest."

Order did not prevail either in the abode or in the laboratory of Agassiz. "In my house everything is astray but nothing is lost," he would say to those who came to consult specimens or books he could not find.

The reputation of the young savant extended rapidly. In 1839, at the

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**Mémoire sur les moules des Mollusques vivants et fossiles.* Mém. Soc. Neuchâtel; II.—*Études critiques sur les Mollusques fossiles. Mémoire sur les Trigonies;* 1840.—*Monographie des Myes;* 1842–1845.—*Iconographie des Coquilles tertiaires réputées identiques avec les vivantes;* 1845.

† *Bibliographia Zöologiae et Geologiae.* A general catalogue of all books, tracts, and memoirs on zoölogy, by Prof. L. Agassiz, corrected, enlarged, and edited by Strickland. London, 1848.

age of 32, the Academy of Sciences made him a corresponding member. Large in stature, well formed, endowed with excellent health, with an amiable face, and an eye which beamed with unusual intelligence, Agassiz gained the sympathy of all who approached him. His countenance was frank and open, his manner winning; he animated the reunions of the naturalist and the work of the laboratories by his vivacity and good humor.

"He was," said one of his scientific adversaries (formerly among his devoted friends), "a man full of kindness, of enthusiasm for science, and easily moved by all that is beautiful and good." A warmth which nothing could repress was with him united with facility and charm of expression. Always ready to frame theories, to discuss them, and to advance new ideas, he captivated his auditors by the vigor and clearness of his exposition. His public and class lectures, too, were always extraordinarily successful. Even when he discussed the most abstruse subject his auditors hung upon his lips. The talent for speaking, which he possessed to a high degree, was one of his most valuable means of influence, and contributed greatly to his celebrity.

He was preminently a zoölogist; he distinguished himself particularly by the justness and promptitude of his perceptions. He knew by the first inspection all a collection contained, the new specimens, the types already described, and he remembered admirably what he had seen. He has been accused of being too ready to form new species. The learned geologist of Berlin, Léopold von Buch, whose peculiar face and eccentric costume often excited curiosity, said one day, "When I am at Neuchâtel, and I knock at the door of Agassiz, I am always afraid." "Why?" asked some one. "I dread lest he will take me for a new species." Science has, however, ratified most of the distinctions he established. His just regard for the value of characteristics led him to circumscribe species within narrower limits, and in this respect he had a happy influence upon paleontology.

His zoölogical works, which were numerous enough to have absorbed several ordinary lives, still did not occupy all his time, and a new field of research was opened to him. Let us then, for a moment, leave the museums and laboratories, and transport ourselves to the foot of the glaciers of the Alps, where we will soon see him arrive with his companions.

For some time the attention of naturalists had been drawn to the presence throughout a large part of Switzerland of blocks of various dimensions, composed of rock different in nature from the soil upon which they rest. How did these rocks, to which has been given the name of erratic blocks, and which are of Alpine origin, come to be dispersed over the Swiss plain and upon the Jura? Two theories are given; Leopold von Buch, Élie von Beaumont, and others, maintain that they were transported by water. But their size, sometimes enormous, and the height at which they are found upon the sides of the Jura, render

this hypothesis inadmissible. To a Valoisian mountaineer, Perraudin, belongs the honor of solving the problem. Observing that the glaciers, at the present time, carry blocks, which they throw off at their extremity, he explained the dissemination of the bowlders in question by the hypothesis that the glaciers must have extended in times past much beyond their present limits, and brought with them, on their surface, material which they left when they retreated. He communicated this idea to Charpentier, who discussed it with him, and ended by adopting it. The dispersion of the blocks is connected with other phenomena which confirm this origin; the polished and rounded surfaces, the accumulation of angular blocks, the hillocks, which have exactly the form of moraines, the unstratified deposits, in which are found pebbles covered with scratches—all these facts, which are repeated to-day in the immediate vicinity of the glaciers which produce them, also show that these same glaciers once covered the larger part of Switzerland, leaving the traces we have indicated. If Perraudin was the inventor of the theory (1815), if Venetz contributed to its development (1833), it was Charpentier who examined it, studied it, perfected it, made it known (1835), and later disseminated it in the world of science with the authority his standing gave him (1841). "To this ingenious and persevering naturalist," said Alphonse Favre, "should be given the greater part of the glory attached to the discovery of this great scientific truth."

Agassiz having heard of this discovery made a visit to Charpentier for the purpose of combating it. He remained several months with him and left well convinced of the truth of the theory, and full of eagerness to verify the proofs already advanced in its favor, to find new ones, and, in short, to study the subject with the activity he carried into everything. The question had been under discussion for some time when the Helvetic Society of Natural Science met at Neuchâtel, under his presidency, on the 24th of July, 1837. The opening discourse turned upon this question, and fell like a bomb in the midst of the most positive adversaries of the glacial theory who happened to be present at the meeting.

Leopold von Buch, who was not famous for sweetness of temper, was very angry, and would examine nothing, hear nothing in regard to the matter. Agassiz, who had foreseen his opposition, had prepared the following paragraph for the close of his speech to mollify him: "When Mr. de Buch affirmed for the first time, in the face of the formidable school of Werner, that granite is of plutonic origin, and that the mountains were raised, what said the Neptunists? He was at first alone in his support of the theory, and it was only by defending it with the conviction of genius that he made it prevail. Happily, in scientific matters, numerical majorities have never at first decided any question."

Notwithstanding the opposition of these great men, who had themselves contributed so much to the progress of science, the theory gained ground, and is to-day generally admitted.

The basis of these researches was necessarily the study of existing glaciers. Their constitution, their increase, their motion, the influence of temperature, the transportation of blocks, the formation of moraines, were all so many questions to be elucidated. Agassiz threw himself with ardor into this new pursuit, and established himself with Desor, Vogt, and others, upon the glacier of the Aar. They constructed a lodging-place under the shelter of a large block of ice upon the centre morain, and went to work. The following year, the block having melted, they formed a cabin of wood and tent-cloth. It was divided into three chambers; the first was both laboratory and parlor, where they received the savans who flocked from all parts of the country to the *Hôtel des Neuchâtelois*, a name the modest abode has retained in the history of science; the second and third, furnished only with straw, served as bedchambers, one for the naturalists, the other for the guides. It may be imagined that the establishment was not comfortable, and it required an unusual amount of energy to lead such a life during several weeks every year. A letter of Mr. Desor gives some idea of the difficulties encountered: "You are much mistaken," he writes to one of his friends, "if you suppose that all is pleasure, satisfaction, and intellectual enjoyment at the *Hôtel Neuchâtelois*. We have been shut up for three days in our tent unable to venture out, the *gux** is so furious. Do you know what a *gux* is? I think not, and you are happy in your ignorance. I can only say in regard to it that if the founders of the various religions had known of the *gux* they would not have imagined a hell for lost souls, but would simply have sent them to the *Finsteraarhorn*, and secured for them a perpetual *gux*. . . . . It takes hold of the limbs, dries the skin, renders the imagination heavy and obtuse, prevents the exercise of the culinary art. In the night of the 21st to 22d it overturned our cabin, and we were obliged to work until morning to restore it again. Imagine how delightful it must have been to work in the open air at a temperature two degrees below zero, while a tempest was constantly blowing clouds of pulverized ice in our faces."† But every day and night was not like this. Gayety and intellectual enjoyment often reigned under the tent on the glacier of the Aar. These expeditions were continued until 1845.

The greatest success crowned these persevering efforts. The ascents made by the Neuchâtel naturalists and their establishment upon the glacier were widely known. Nothing similar had been undertaken since the explorations of de Saussure on Mont Blanc. The Genevese savant was too early in his efforts to have many imitators. But an excursion to Zermat, the ascent of the Jungfrau and of the Schreckhorn gave an impetus to mountain excursions, which began from that time to be popular. In the mean time our naturalists were studying seriously the constitution of the glaciers and the phenomena connected with them,

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*A whirlwind of snow, called so in the Oberland.

†Letter to M. A. Favre, August 1, 1842.

and notwithstanding their want of familiarity with the laws of physics, the subject was so new that they rapidly acquired valuable information.

On his return from each expedition Agassiz published the results of his researches. His object was not only to give an account of his observations, but to disseminate the theory of which he had become the defender and promoter. Numerous memoirs upon present and ancient glaciers of Switzerland, upon the glacial theory, upon the erratic blocks of the Jura, bear the date of these years. Large works which appeared later at Neuchâtel and at Paris contained the results of his studies.*

These works revealed numerous phenomena then completely unknown, made the knowledge of the glaciers popular throughout the world, and gave a decisive impulse to this kind of study.

Many years later Agassiz, while navigating the river Amazon, gave the following illustration of the aspect presented by the glacial period: "There is a phenomenon not uncommon in the autumn in Switzerland which may help us to reconstruct this wonderful picture. Sometimes in a September morning the whole plain of Switzerland is filled with vapor, which, when its pure white undulating surface is seen from the higher summits of the Jura, looks like a snow-covered *sea of ice*, appearing to descend from the peaks of the Alps, and extending toward the Jura, while from all the tributary valleys similar masses pour down to meet it."†

In 1840 Agassiz went to Great Britain to seek there for traces of ancient glaciers. He had no trouble in finding them both in England and in Scotland. His journey through the country was a veritable triumph, a series of ovations.

This period of incessant activity, during which the scientific corps of Neuchâtel became so honorably distinguished, was not, however, for Agassiz a period of undisturbed happiness.

To meet the expenses of his extensive publications, his travels, his expeditions to the glaciers, a large fortune was necessary, and this Agassiz did not possess. The sums he owed to the generosity of the King of Prussia, and which at that time had taken the form of a regular pension, were not at all sufficient for his needs, and rapidly disappeared in the gulf of his expenses. Still the fire of his activity his labors, his expeditions, continued; but the situation at last became so critical that he was forced to bring order into his affairs. Some letters of this time show the serious embarrassment these difficulties occasioned him. "I am frightened at the approach of a new year, the time for the settlement of accounts in Neuchâtel, and I work like a madman to be able to meet my indebtedness. If God preserves my health I hope, after one or two years of continued labor, if I moderate my expenses, and particularly if I abstain from publishing anything more on my own account, to

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*Agassiz. *Études sur les glaciers, avec un atlas de 32 pl.* Neuchâtel, 1840. *Nouvelles études et experiences sur les glaciers actuels.* Paris, 1847.

†A Journey in Brazil, by Professor and Mrs. Louis Agassiz, Boston, 1868, chapter iii, p. 116.

settle my affairs completely, but for the time I am horribly cramped, I must say almost paralyzed; but it is my own fault, and I must bear patiently the consequences until I can succeed in getting myself afloat again." "My great regret in the present condition of my affairs is that I am obliged to employ a portion of my time with matters I ought not to have neglected, and which occupy me now much more than if I had always attended to them, and then I am obliged to retard some of the publications I greatly desired to make next, but which it would be imprudent for me to undertake at present, for I should reproduce the embarrassment from which I only just commence to be relieved if I did not conduct all my enterprises with the utmost circumspection." "My life," he writes again, "is now a vortex, in which the best part of my nature is hardly conscious of its existence, so numerous and pressing are the exterior exigencies from which I suffer."

But how many grand ideas, how many admirable works, would have been lost to science if the young savant had not been willing in his publications to dispense with the economy he would have been obliged to exercise to keep within his moderate pay as a professor.

Agassiz was devoted above all things to science; devoted without reserve; and he had always great talent in making others share his enthusiasm. Bringing into contribution the talents of some, the purses of others, adding all his own resources, modest it is true, but also all his time and his genius, he attained a result evident now to every one. A letter he wrote to Professor Silliman, when about to embark for America, shows how entirely he gave himself to science. "In order to provide for the extra expense, I shall be obliged to live very economically and in a manner little in accordance with the royal munificence which has furnished the means of making this journey." And, again, "My sphere is entirely circumscribed by the scientific world, and all my ambition is limited to being useful to the branch of science I particularly cultivate. With all this I am no misanthrope; but I learned early that where one has no fortune, one cannot serve science and at the same time live in the world. If I have been able to produce numerous expensive publications, it has been only by following this system of economy and voluntary seclusion; and the results which I have obtained thus far have rewarded me so well for the privations which I have suffered, that I have no temptation to adopt another style of life, even should I hereafter, and especially in your country, suffer more trouble than I have had to sustain in my own."*

Discord, however, had penetrated the scientific coterie of Neuchâtel. Enthusiastic over new ideas, Agassiz entered into them with ardor; when he found them just he developed them and diffused them. Older than his colleagues, more enterprising, already well known in the scientific world, he published under his own name the work done in his

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*Letter to Professor Silliman, October 20, 1845. American Journal of Science: 1874. Vol. vii, pp. 78, 79.

laboratories, giving to the names of his collaborators a secondary place. It was he who inspired the work, who collected the material, who bore the expense of the publication. But the aids soon demanded the credit they considered their due; hence arose dissatisfaction and disagreements, which continued to increase until the union was dissolved. Mr. Vogt was the first to leave the association in order to go to Paris; Mr. Desor continued to labor on Agassiz's works, even after the departure of the latter for America. He later joined the savant there, but he afterward returned to Europe. One cannot but regret that these personal questions should have interfered so soon with the happy scientific labor of that time.

Agassiz passed the winter of 1845–'46 at Paris. The vast collections, public and private, of that city were generously placed at his disposal, and enabled him to complete, with the valuable assistance of M. Desor, his researches upon the Echinoderms. Those of Alcide d'Orbigny, of Deshayes, of Mechelin, of Graves, of Alexander Brongniart, of de Verneuil were in turn examined. The gallery of the museum containing the Echinoidea was reserved for him and closed to the public, and hither were brought in succession all the cases and barrels containing Echinoids. Considerable material, derived from the scientific explorations of Baudin, of Freycinet, of Captain Duperré, passed also through his hands. All these documents were used in the publication of the *Catalogue raisonné.* According to the classification adopted, the Echinoderms are subdivided into three orders: The Stelleroids which include the Asteroids, the Ophiuroids and the Crinoids, radiated animals, either free or fixed, and of which the body is furnished with rays. The Echinoids, or sea-urchins, with a body globular and covered with regular plates, and the Holothurioids, of which the body is coreaceous, or leathery, and elongated. He divided the Echinoids into four families: Cidarida, Clypeastroidea, Cassidulidea, and Spatangoida. In his preceding works he deduced from the structure of these animals and their successive appearance important consequences for the general history of creation.

He sought at the same time to propagate the glacial theory, which still encountered in the ranks of French science a lively opposition; but he discussed it only in private conversation. This subject did not excite much interest in the scientific public, who knew little of the mountains, and the heads of science entertained contrary ideas.

This same year Agassiz, whose reputation was already far extended, was called to Boston, in America, by Mr. Lowell, director of the Lowell Institute, to give some lectures. He was also, thanks to Humboldt, charged by the King of Prussia with a scientific commission in that country. He went to England in the summer of 1846, and sailed for Boston in the month of September.

III.

Arrived in America, where his reputation had preceded him, he did not lack encouragement and support in that country, where great ideas so easily find an enthusiastic public and generous protectors. The first of the lectures he gave in Boston was repeated eight times to an audience always new and always eager to hear. The success of the subsequent lectures was equal to that of the first. From the very outset the learned naturalist acquired great popularity. He was surrounded, fêted, made much of, and was charmed by the zeal manifested on all sides for natural history. The first part of his sojourn was passed in giving single and courses of lectures. Embryology and the glaciers were his most frequent subjects.

After his debut at Boston he lectured successively at New York, Albany, New Haven, and Charleston, where he passed the winter of 1847–'48. He at the same time determined to profit by the resources which surrounded him, and immediately commenced to make collections. Everything about him was new, and he had only to stretch out his hands in order to fill them. A generous American, Mr. Abbott Lawrence, convinced of the importance of retaining a man of such value in the country, offered in 1847 to create a chair for him of zoology and geology in Harvard College, Cambridge, if he would remain. Agassiz, who had come to the United States with very favorable anticipations, far surpassed by the welcome he had received, did not hesitate to accept the proposition. He comprehended that his reputation would give him promptly a power and means of action which he could never acquire in Europe. Establishment in this country would also put an end to the rivalries, the cares of all sorts, to which he was a prey in Neuchâtel. He would be able to consecrate to science his time and his strength without being obliged for want of money to restrict or retard his publications. He abandoned, then, without regret the modest theater where he had first distinguished himself, and commenced an entirely new career, in which he was to find resources even beyond his brightest dreams.

He took possession, upon his return from Charleston, of the chair of natural history, which had been offered to him. His dwelling was at Cambridge, in Oxford street. Count Frank de Pourtales, Professors Desor, Marcou, Guyot, Lesquereux, and his draughtsman, Burckardt, who since his sojourn at Munich had always worked for him, now joined him. Several of these naturalists lived for some time with him. He received them bounteously, and aided them with his influence and his purse, at that time better filled than when he was in Neuchâtel. Soon he sent for his son Alexander, whose taste for natural history was a great joy to him. He passed the first four months of the year 1849 at Philadelphia, where he gave courses of lectures, and in the winter of 1849–'50

he married Miss Elizabeth Cary, of Boston, a lady of great intelligence, who became the inseparable companion of his travels and of his work.

The exploration of America was a vast field opened to him, and he devoted to this work a very important part of his time. In 1848 he undertook the charge of a scientific expedition to Lake Superior. Seventeen persons started on this exploration in a country the geography and natural history of which were still very little known. The zoology, the botany, the general character of the country and the indigenous inhabitants, the influence even of the progress of civilization upon the aspect of the country, upon the character of the fauna and of the flora, all were observed, recorded, discussed; nothing of importance escaped the eager and masterly eye of the chief of the expedition.*

The history of the journey was made by Mr. Cabot; the shells, insects, and birds collected were studied by various collaborators. Agassiz devoted especial attention to the general characteristics of the vegetation, in order that he might compare it with that of the Jura and the Alps; to the fishes, the study of which wherever he went always captivated him; to some new reptiles, and finally to the phenomena of erratic bowlders in this region, which his knowledge of the glacial district of Europe permitted him to prove belonged to a remarkable extension of the same system.

The Americans have devoted for a long time especial attention to the study of the shores of their continent. The department of the government occupied with what is called the United States Coast Survey is now known all over the world on account of the great importance of the work it has accomplished. It united to a geographical knowledge of the coast a scientific study of the neighboring region, often pursued under great difficulties. Agassiz from the first was interested in this species of investigation. In 1850 he was commissioned by Dr. Bache, director of the survey, to study the coral reefs of Florida. He examined upon the spot the development of the Polyp, which had created around this peninsula four concentric banks, the formation of which he found had been successive. According to the mode of increase of these animals, he could calculate safely within the limits of truth that these reefs had been at least thirty thousand years in forming. The outer reef, still in process of development, is constituted of the living coral. The animals belong to various types, each of which is limited to a certain depth beyond which it cannot exist. The deepest are the Astræans, next the Meandrines; at the surface are the Madrepores, not more than two or three yards below the surface of the water and covering vast spaces with their beautiful growth. Other animals become attracted to the coral branches. The sea breaks off the coral and throws the fragments upon the reef, which is little by little covered with soil,

*Louis Agassiz. "Lake Superior, its physical character, vegetation, and animals, compared with those of other and similar regions. 1850."

and rises at last above the water. The winds then bring to it seeds, and plants are developed. Thus appears an island separated by a small lagoon from the mainland, to which it will soon be united. Florida has been entirely formed in this way by successive creations. The time required to produce this peninsula, according to Agassiz, must have been more than two hundred thousand years.

At the same time that Agassiz undertook to direct these expeditions he desired to make known the results of his researches and the labors undertaken in his laboratories. The great collections he amassed attracted his attention to all branches of the animal kingdom. The Vertebrates, the Mollusks, the Articulates, the Radiates, the relations of these branches to each other, their mode of appearance and development, were for him an incessant source of new observations, published in numerous articles and memoirs.

In 1857, he gave to the public the plan of a work to be called *Contributions to the Natural History of the United States*. The popularity of the professor was at that time so great that he immediately obtained more than 2,500 subscribers. Four volumes of this work appeared in succession.*

The first monograph comprehended a complete study of the Chelonians, their anatomy, their distribution in the actual world and in geological history, the description of American genera and species, and the embryology of the turtle. The second, in the preparation of which Mr. Clark rendered active assistance, is upon the Acalephs, which form with the Polyps and the Echinoderms the class Radiata; they are divided into Ctenophores, Discophores, and Siphonophores. Mr. Sonrel was the artist of the magnificent plates which accompanied these two volumes. A complete *résumé* of the ideas and the principles of Agassiz relative to the classification of the animal kingdom, serves as an introduction to these monographs.

"In the beginning of this chapter," he writes, "I have already stated that classification seems to me to rest upon too narrow a foundation when it is chiefly based upon structure. Animals are linked together as closely by their mode of development, by their relative standing in their respective classes, by the order in which they have made their appearance upon earth, by their geographical distribution, and generally by their connection with the world in which they live, as by their anatomy. All these relations should, therefore, be fully expressed in a natural classification; and though structure furnishes the most direct indication of some of these relations, always appreciable under every

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*Contributions to the Natural History of the United States; in quarto volumes, with numerous plates. Volume I, Essay on Classification; North American Testudinata. 1857. Volume II, Embryology of the Turtle. 1857. Volumes III and IV, Acalephs in general, Ctenophoræ, Discophoræ, Hydroidæ, Homologies of the Radiata. 1860–1862. The introduction to the first volume, "An Essay on Classification," was republished under the author's direction, at London, in 1859, in 1 vol. 8vo., pp. 381.

circumstance, other considerations should not be neglected which may complete our insight into the general plan of creation." *

In this point of view Agassiz had already perceived through his study of fossil fishes the importance of embryology. He had for the first time propounded the theory that the animals of our period in their embryonic condition resemble the ancient representatives of the same type who lived in anterior geological ages.

Classification, based upon these considerations, will no longer be a system invented by such or such a naturalist, but will result strictly from facts observed in nature. It will be proved, for example, that an insect in various degrees of its development resembles successively types of various classes of the branches of the Articulata, and that it assumes the character of a perfect insect only after it has achieved its metamorphosis. "When we study the gradual development of the insect * * * we have a simple, natural scale by which to estimate the comparative rank of these animals. Since we cannot suppose that there is a retrograde movement in the development of any animal, we must believe that the insect stands highest (compared with crustacea and other articulates), and our classification in this instance is dictated by nature herself." †

"It may therefore be considered as a general fact, very likely to be more fully illustrated as investigations cover a wider ground, that the phases of embryonic development of all living animals correspond to the order of succession of their extinct representatives in past geological times. As far as this goes the oldest representatives of every class may then be considered as embryonic types of their respective orders or families among the living." ‡

The class of Echinoderms furnishes a remarkable example. It is thus that the embryonic phases of the European Comatula correspond with the principal forms of the Crinoids which characterize the successive geological periods; Cistoids of paleozoic rocks; Platycrinoids of the carboniferous period; Pentacrinoids of the freestone and the oolite. Analogous facts are found in the families of the Asteroids and the Echinoids. The Trilobites are the embryonic type of the Entomostracans; the Decapods of the oolite that of our crabs; the heterocercal Ganoids that of the Lepidistes.

By the side of these *embryonic* types Agassiz recognized *prophetic* types. "Embryonic types exemplify only the peculiarities of development of the higher representatives of their own types; while prophetic types exemplify structural combinations observed at a later period in two or several distinct types." One of the most striking examples he cites is that of the sauroid fishes. "These fishes, which have preceded the appearance of reptiles, present a combination of ichthyic and reptilian

* An Essay on Classification. 8vo., London., 1859. Chap. i, sec. 32, pp. 205, 206.
† A journey in Brazil. Boston, 1868, chap. i, p. 21.
‡ Essay on Classification, chap. i, sec. 25, p. 174.

characters not to be found in the true members of this class, which form its bulk at present."

The succession of organized beings in the course of time should also serve as a principle of classification. Thus in arranging, as many botanists do, the Gymnosperms among the Dicotyledons, we find no relation between the hierarchical series of the living plants and their mode of appearance. If we make of the Gymnosperms an isolated group, intermediate between the Cryptogams and the Angiosperms, a classification which corresponds with their principal characteristics, we find immediately an intimate correlation between the hierarchal series of these plants, which commence with the Cryptogams and continue with the Gymnosperms, the Monocotyledons, and Dicotyledons, and their successive appearance.

"I confess," said Agassiz, "that this question as to the nature and foundation of our scientific classifications appears to me to have the deepest importance; an importance far greater, indeed, than is usually attached to it. If it can be proved that man has not invented but only traced this systematic arrangement in nature; that these relations and proportions which exist throughout the animal and vegetable world have an intellectual, an ideal, connection in the mind of the Creator; that this plan of creation, which so commends itself to our highest wisdom, has not grown out of the necessary action of physical laws, but was the free conception of the Almighty Intellect, matured in His thought before it was manifested in tangible external forms; if, in short, we can prove *premeditation* prior to the act of creation, we have done once and forever with the desolate theory which refers us to the laws of matter as accounting for all the wonders of the universe, and leaves us with no God but the monotonous unvarying action of physical forces, binding all things to their inevitable destiny. * * *

"To me it appears indisputable that this order and arrangement of our studies are based upon the natural primitive relations of animal life; those systems to which we have given the names of the great leaders of our science who first proposed them, being in truth but translations into human language of the thoughts of the Creator. And if this is indeed so, do we not find in this adaptability of the human intellect to the facts of creation, by which we become instinctively and—as I have said—unconsciously the translators of the thoughts of God, the most conclusive proof of our affinity with the Divine mind? And is not this intellectual and spiritual connection with the Almighty worthy of our deepest consideration? If there is any truth in the belief that man is made in the image of God, it is surely not amiss for the philosopher to endeavor by the study of his own mental operations to comprehend the workings of the Divine Reason, learning from the nature of his own mind better to understand the Infinite Intellect from which it is derived."†

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*Essay on classification, Chap. i, sec. 26, p. 177.

†Essay on Classification, chap. i, sec. 1, pp. 10 and 9.

I have given this long quotation, because it shows clearly the elevated philosophical and religious point of view from which Agassiz regarded the history of creation.

It is seen by the examples given what importance he attached to paleontology. He endeavored to show that from the ancient geological periods the number and diversity of animated beings was as great as it is to-day. Certain rocks are formed entirely of the *débris* of organized beings. The coral reefs of the tertiary, secondary, and even primary periods are in no wise inferior to the present reefs.* The coal-beds of the carboniferous period exhibit a vegetation richer than our tropical flora. These myriads of beings which have ceased to exist he regarded as the manifestation of the divine thought, which regulated their mode of appearance and succession. "There were at various intervals during the successive geological ages periods of creation, all the species of animals and of plants created at each period having lasted for a given time in order to be replaced successively by others." The present creation is, according to his view, one of these phases, and he believed that all the animals in it appeared simultaneously.

Agassiz always remained faithful to this theory, which had many adherents at the time he advocated it. Science has made great advances since that period. The progress of paleontology, to which he contributed so largely, as well as that of zoological and botanical geography, demonstrates by the fullest evidence that the animated world which peoples the surface of the globe could not have issued complete and simultaneously from the hands of the Creator, for in the midst of new types there exist offshoots from numerous groups, whose great development took place in the anterior geological periods, while other types have acquired in the present epoch a force and extension they never had before, although their successive increase was indicated in the later geological periods. The present ferns are only the representatives, greatly diminished in size, of that large group of Cryptogams which at the carboniferous period clothed the entire world with their colossal vegetation, and which since then have been constantly diminishing.

The traveler who encounters isolated in the mountains of China the singular conifer called the *Ginho biloba* will not hesitate to consider this type, unique in the present creation, as the last descendant of the Ginho which, at the secondary period, covered with a great number of species all the ancient continent. The zoologist who finds in the rivers of Australia the *Lepidosteus osseus*, the last representative not only of a genus but of an entire order of fishes, that of the Ganoids, cannot fail to recognize in this type the remains of an extinct race. The Marsupials of the same country, the Edentates of South America, and a hundred other examples furnish us to day-with the proof that the actual world is only the regular normal continuation of anterior periods. In spite of the embryological theories of which Agassiz was the author, and which it

*American Journal of Science, 1854, vol. xvii, pp. 309–324.

would seem must necessarily have led him to the idea of evolution, he always remained an absolute partisan of the hypothesis of successive creations, and he may be regarded as the chief of the opposition to the theory of development.

The fact that the most distinct types exist simultaneously in identical circumstances, and that we find identical types in the most different circumstances, the entire development of the animal kingdom, the harmony in its most diverse parts, its present and past distribution upon the continents and in the sea, furnished him unceasingly with new arguments to combat this theory and to defend that of the individuality and the constancy of species.

If it is evident that the flora and fauna are renewed a great number of times on the surface of the globe, it has never been proved, according to him, that the species were changed during one of those periods. The observations made of the times in which we live, indicate that they remained invariable during each period. This is demonstrated by the plants and animals found in the tombs of Egypt and the fauna of the coral reefs of Florida. Daily discoveries contradict strongly the opinion that inferior beings first appeared upon the earth, and that types more and more elevated were manifested until the advent of man. On the contrary, representatives of numerous families of the four great branches of the animal kingdom, Radiates, Mollusks, Articulates, and Vertebrates, lived simultaneously from the most ancient periods. The Vertebrates alone have not yet been found in the first deposits, but they appeared in immense numbers before the end of the first period. These branches, which manifest in their structure a complete independence, have traversed side by side all the series of geological ages up to the present time. The first three are even represented from the beginning by numerous types of their different classes, and the character of the branches of the classes of the families have always been as distinct as to-day. "Until the facts of nature are shown to have been mistaken by those who have collected them," said Agassiz, "and that they have a different meaning from that now generally assigned to them, I shall consider the transmutation theory as a scientific mistake, untrue in its facts, unscientific in its method, and mischievous in its tendency."*

Agassiz preferred greatly direct observation of nature to theoretic research, and he found more than any other naturalist opportunities for this study in his numerous voyages and in the immense material he collected. In a country so rich, so varied in climate and conditions, and also so new, his collections rapidly accumulated; he sold them in 1852 to Harvard College. A building which had been put up to receive them proved to be too small. The University of Cambridge, aided by a public subscription and by the State of Massachusetts, caused to be erected the first wing of a large edifice, which was to bear the name of the Museum of Comparative Zoology. Mr. Fr. C. Gray bequeathed $50,000 to

* On the Origin of Species. Am. Journal of Science. 1860. Vol. xxx, p. 154.

found this establishment. The first stone was laid on the 14th of June, 1859, and in December of the same year the building was sufficiently advanced to commence the installation of the collections.

From that time Agassiz had but one aim, the increase and organization of this museum. "His activity, researches, diplomacy, resources," wrote to us one of his friends who saw him at work, "are something prodigious. He spared nothing where his museum was concerned, gave public lectures, resorted to all kinds of devices to promote its interests: he put under contribution all his friends and acquaintances; he spoke of nothing, saw nothing, but his museum; it became his one idea." The gifts of natural objects and of money poured in from all sides. The State and private individuals rivaled each other in generous assistance of this great work which Agassiz had succeeded in making a national affair, and in a few years the pecuniary subsidies amounted to the sum of $470,000. During the years 1872 and 1873 alone the museum received besides its annual supplies gifts equal to about $170,000.

The vast learning of Agassiz, his amiability, his benevolence, his affable gaiety, his enthusiasm for everything relating to science, and his personal disinterestedness, everywhere created for him friends who contributed to the increase of his museum. Never had any one so many. His language, winning and often rising even in English to true eloquence, captivated his audiences and attracted the crowds he loved to teach. He was in communication with all the sea-captains, who made collections for him in their distant expeditions. When he was on a voyage everybody was at his disposal, and more than once the inhabitants of the distant countries he visited made journeys of considerable extent in order to procure some rare animals for him only for the pleasure of seeing his joy, his astonishment, and his gratitude, which were always very warmly and openly expressed.

All parts of America were explored. The Emperor of Brazil, whose interest in science has never flagged, sent him rich collections. The soundings made along the coast of America by the United States Coast Survey, under the direction of Mr. de Pourtalés, and especially the voyage to the valley of the Amazon and the expedition of the Hassler, added greatly to these zoological treasures. In 1863, that is to say, before the expedition to Brazil, the museum already contained 6,000 species of fish, represented by 100,000 specimens. It is not, like most collections of natural history, a mass of material disposed in a purely zoological order. Its organization is based upon the principles of classification we have described; and we find in it several distinct series. In the first the animals are classed in such a manner that one can study their natural associations, their zoological relations, the general characteristics of the genera and of the classes, their skeletons, and other anatomical peculiarities. A second series represents the fauna of each region, the geographical distribution of living beings upon the surface of the globe and their various associations, upon each continent. The fossil animals are

arranged so as to show at the same time their order of succession in the different epochs and their relation with the existing animals. This plan is completed by a third series devoted to the study of the various phases of development of animals from the embryonic to the adult condition. This museum, then, is destined to be an exposition of the history of creation, as complete as it is possible for it to be under the present state of our knowledge. Its organization absorbed more and more the time and energy of Agassiz. No other scientific establishment has aspired to a similar undertaking.

When it came to the recent creation, it increased so rapidly that in 1872, in his last report of the progress of the establishment, Agassiz could say that he was "in possession of the most beautiful collections in the world, not excepting the oldest and largest museums of Europe." What increased still more their value, was the zoological and paleontological labors to which these collections gave rise. Naturalists of great distinction, Mr. Alexander Agassiz, our compatriots Messrs. Alexander de Pourtalés, Lesquereux, and some American scientists, Messrs. Lyman, Hyatt, &c., described these treasures in works illustrated with magnificent plates.

A voyage which Agassiz made to Europe in 1859 interrupted for some time his incessant occupations. He was not forgotten in the Old World, the scene of his first successes. The most brilliant offers were in several instances made to him to induce him to remain, but he had in America too many resources of all kinds to make him able or willing to abandon his adopted country; his only ambition was for science, and he always continued faithful to the direction of his museum. He was naturalized as an American citizen in 1862.

The numerous labors he directed at last affected his robust health. During the winter of 1864–'65 the physicians ordered absolute repose and a change of climate. But this rest proved to be as profitable to science as the continuations of the works he had undertaken. After some hesitation Brazil was selected as the destination of his voyage. He had been for a long time attracted toward this country, to which his first zoological researches had turned his attention. "Toward Brazil I was drawn by a life-long desire. After the death of Spix, when a student of twenty years of age, I had been employed by Martius to describe the fishes they had brought back with them from their celebrated Brazilian journey. From that time, the wish to study this fauna in the regions where it belongs had been an ever-recurring thought with me; a scheme deferred for want of opportunity, but never quite forgotten."*

In order to render this voyage of real use, in order that he might not return to the United States "rich in pleasant memories but without any scientific results," resources were necessary far beyond those required for his personal expenses. Here, as on so many other occasions of his life, bountiful means were voluntarily provided. Mr. Nathaniel Thayer

* A journey in Brazil. (Preface, p. v.)

offered to defray the expenses of the expedition, and authorized him to take with him, as assistants, six naturalists. The Emperor of Brazil, the Secretary of the Navy of the United States, the president of the Pacific Mail Steamship Company, each contributed in large measure to the success of this expedition, which had been joined by some distinguished naturalists as voluntary recruits. On the 1st of April, 1865, Agassiz embarked, taking with him Mrs. Agassiz, who kept the journal; her husband communicated to her the scientific results as they were obtained, and thus was composed the book known under the name of "A Journey to Brazil." We refer to this volume any of our readers who desire to follow the American savans along the borders of the Amazon and explore with them the vast basin they undertook to study.

Agassiz, during this voyage, made immense collections. These have already been, in part, studied and described, and will give rise to works which will make better known to us the fauna of the extraordinary region. He observed, also, many general facts of natural history. The account of the expedition manifests the great talent he possessed of noting every peculiarity offered to his observation in the zoological character of the animals he discovered, in the ichthyological fauna of the Amazon, in the geographical distribution of the terrestrial and aquatic animals, and in the physical and geological characteristics of the great valley he traversed.

One of the points which fixed his attention and to which he constantly refers in the history of the voyage, is the nature and the distribution of the *drift* of this region. This deposit, which is of great thickness and immense extent, for it is estimated to be some thousand miles in length and six or seven hundred in width, could not have been formed by the sea, since there were no traces found of marine shells. It is, then, a fresh-water deposit. If a lake had occupied this vast space the basin must have been closed; otherwise, this material would have been carried into the sea. Agassiz attributed this phenomenon to the ancient extension of the glaciers. An immense glacier, according to him, descended from the Cordilleras, augmented by tributaries from Guiana and from Brazil, and covered the valley of the Amazon. It accumulated at its lower edge a moraine of colossal dimensions, forming thus a gigantic embankment, which bars the mouth of the basin.

It is true that polished and scratched surfaces are not found; the rocks are too soft to have retained such traces, but the rounded rocks Agassiz observed in some localities, the blocks of the Ereré, the nature of the deposit in the valley, the character of which is analogous to that of the material accumulated under the glaciers; the resemblance of the upper formation of this country to the *drift* of Rio, the glacial origin of which seemed to him beyond a doubt; the fact that the basin of fresh water must have been closed on the side of the ocean by a powerful barrier, appeared to him sufficient arguments to establish the existence of this glacial period. Later there was a rupture in the exterior

embankment; the lake was emptied, while the moraine, beaten by the sea and carried away by the flowing waters, disappeared, as was also the case in great part with the ground upon which it rested; for the violence and the rapidity with which the sea eats into the shores of this region is extreme, and a strip of hundreds of miles in width has already been carried away. *

Such is, in a few words, the theory of Agassiz of the ancient glaciers of Brazil. This is not the place to discuss its claims; it was attacked on all sides, and has now few defenders.

In his latter years Agassiz, overburdened with his occupations, abandoned special research; the organization of his museum, his public courses of lectures, his immense correspondence, were too much for his strength, and his health gradually failed. In 1869 he became seriously ill. He had hardly recovered before he was at work again. He accompanied Count Pourtalés on one of the expeditions this zoologist made in the year 1867, to study the submarine relief, the currents, and the marine fauna of the coasts of America. These explorations, in which each sounding gave rise, so to speak, to a discovery, captivated him extremely, and he soon conceived the idea of extending this kind of research. In 1871 he joined an expedition organized by the Government of the United States for the exploration of the shores of America, the study of the Gulf Stream, the temperature of the water, and the marine animals. He sailed in the Hassler, and visited in this vessel the sea of the Antilles and the shores of America as far as San Francisco, doubling Cape Horn. A letter he wrote to Professor Pierce before starting, in which he set forth the results he hoped to obtain, drew upon this expedition the attention of all the scientific world. He hoped to find living at the bottom of the sea a large number of the types known only by fossil representatives, and thus connect the actual with anterior creations.

Soundings were made at first at great depths, but the apparatus was in a bad condition, and on the coast of Chili this kind of research had to be abandoned. Agassiz contented himself with the coast animals and the fishes, which he collected by thousands. In every port the deck of the vessel was covered with animals brought by the natives. The singular fauna of the Gallapagos Islands were collected with the greatest care, and Agassiz was able, among others, to procure numerous shells of two species of reptiles of the genus *Amblyrynchus*, the structure of which recalled that of these animals in the secondary period. Some idea may be formed of the collections made in this voyage, by the fact that the quantity of alcohol used to preserve the animals was about 3,500 gallons. He came back to Cambridge by the Pacific Railroad.

Immediately on his return he formed the project of establishing on the sea-shore a school for zoological research. As soon as the idea was conceived, an American, Mr. Anderson, gave him in 1871 a small island in Buzzard's Bay, the island of Penikese, and a considerable sum to assist

* Journey in Brazil, Chap. xiii, pp. 419–436; Atlantic Monthly, 1866, pp. 49, 150.

in carrying out his design. The illustrious naturalist immediately profited by these resources. He constructed large laboratories provided with aquaria and other arrangements necessary for this kind of research. The upper story of the building contained fifty-eight rooms for the lodging of the naturalists. Every effort was made to hasten the execution of the plan. The consequent increase of fatigue exhausted him. On the 2d of December, 1873, he gave a public address to the Agricultural Association of Massachusetts. He was in his laboratory for several days after, but was attacked on the 6th of December by weakness, which forced him to return home. He went to his bed, which he never left again, and expired on the 14th of December of a paralysis of the organs of respiration.

The Academy of Sciences, of Paris, had a few months before nominated him foreign associate member.

"For a long time," wrote Professor Silliman, who had been one of his best friends since his arrival in the country, "have we dreaded the sad event which we now record. For many years the splendid physique of Agassiz manifested signs that his prodigious labors were overcoming his elasticity. His herculean strength, which made fatigue of body or mind unknown to him, yielded to the severer tax of the American climate and the incessant growing demands upon him from every source. His life and strength were renewed by his long voyage to San Francisco in the Hassler; but both he and his friends recognized the fact that to labor with his former activity was impossible and forbidden. Yet to live, was for him unavoidably to labor; and to die in the harness rather than to live after the power to serve his fellow-men was passed—his aspiration."*

The death of the great naturalist, to whom this noble sentiment could be justly attributed, was a national calamity. An immense cortege formed by deputations from several cities, the Vice-President of the United States, the authorities of the State of Massachusetts, delegates from universities, academies, and learned societies, his numerous pupils and assistants, and a large concourse of citizens accompanied Agassiz to his last home.

A bowlder from the glacier of the Aar, upon which is engraved his name, serves as a monument to him and recalls to those who visit it his native country and one of the great interests of his life.

The prodigious capacity of Agassiz, his exceptional talent for observation, the facility with which he made himself familiar with all questions and with which he attacked the most diverse subjects, the great intellectual movement he developed wherever he lived, the value of his own researches, have made his name one of the greatest in contemporary science. He has been the object, both while living and even after his death, of violent and sometimes coarse attacks; calumny has not spared him. But in every case it is not he who has been most injured. Un-

*Amer. Jour. Science, 1874, vol. vii, p. 80.

doubtedly, several of the ideas he put in circulation have been dropped, several of his theories have been abandoned, but the discussions they produced have been a fruitful source of progress. The temple of knowledge is not raised by a single effort, and it is the clashing of ideas which produces light. The work he executed in the field of zoology and of paleontology is of very high importance. He possessed the double merit of accomplishing great things himself, and of knowing how to make science popular without diminishing its prestige. Everywhere he found friends and supporters. In Switzerland, in Germany, in England, in America, in every country where he took up his abode he made himself the center of the scientific movement and succeeded in interesting the public. His sojourn in Neuchâtel excited in that city an impulse the happy influence of which is felt even to this day. Although when he first went to the United States there existed scientific culture in that country, and many distinguished observers, to Agassiz must be attributed the diffusion of a new enthusiasm for the sciences and much of the success with which they are now cultivated. This result is not due to chance, but to the noble and legitimate influence exercised by the superior intelligence of the savant, and the amiable qualities of the man.

HENRY AND THE TELEGRAPH.

By William B. Taylor.

"Yet though thy purer spirit did not need
The vulgar guerdon of a brief renown,
Some little meed at least—some little meed
Our age may yield to thy more lasting crown."

In the impulsive tide of popular applause which follows the consummation of great enterprises, or the material advancement from new conquests of natural law, the labors and merits of those who patiently laid the deep and broad foundations of these successes, or who with rarest diligence, sagacity, and skill, made such successes practicable, are usually whelmed; and—save by the scientific student, are mostly forgotten and ignored. And this result is the more assured by reason of the entire self-unconsciousness and devotion with which the higher work of original research is conducted, with no disturbing thought on the part of the investigator, of reaping immediate advantage or reward from the bestowal of the new discovery.

"For praise is his who builds for his own age;
But he who builds for time, must look to time for wage."*

That the award of time respecting Henry's true relation to the telegraph will be discriminating and just, may be confidently anticipated, since the materials and data for an accurate judgment are already matter of enduring record.† In attempting here to briefly review this record, justice will best be done to Henry's fame by rendering full justice to Henry's predecessors.

The Growth of the Electric Telegraph.—"The electric telegraph had properly speaking, *no inventor*. It grew up little by little, each inventor adding his little to advance it toward perfection."‡ These words of soberness and truth are little apprehended by the multitude; who blind alike to the beginnings and to the growths of great ideas, contemn the

* Prof. Grant Allen.

†In the spirit of Kepler (though with less of self-assertion), Henry, with a modest estimate of his own contributions to science, while evincing a remarkable indifference to popularity, yet with the quiet confidence of a clear and impartial judgment, declared "I was content that my published researches should remain as material for the history of science, and be pronounced upon according to their true value by the scientific world."—(*Smithsonian Report* for 1857, p. 87.)

‡ *The Electric Telegraph.* By Robert Sabine. 8vo. London, 1867, part i, chap. iv, sect. 39, p. 40.

discoverer while they deify the artisan. When Galvani about a century ago (1786) first opened slightly the door to one of nature's marvels, that large community ever distinguished by the vigor of its common sense and the practical solidity of its judgment, asked with ready instinct the wise and ancient question, "What is the *use* of it?" And a majority of those who recognized the experimenter's appearance on the streets of Bologna, pointed him out as the "frog philosopher." Their descendants and representatives at the present day have neither lost—nor gained in wit.*

It is proposed to notice the development of the electric telegraph somewhat at length, in order to exhibit more clearly the precise nature and value of Henry's contribution to its practical establishment and success. This survey naturally divides itself into a chronological review of the successive though overlapping applications—of frictional or mechanical electricity (first suggested by Franklin? or by Lesage? about the middle of the last century);† of galvanism or chemical electricity (first suggested by Sœmmering in 1808); and of galvano-magnetism (first suggested by Ampère in 1820).‡

Among the numerous flights of imagination by which genius has frequently anticipated the achievements of her more deliberate and cautious sister—earth-walking reason, none is perhaps more striking than the romantic conception by Famianus Strada, of Rome, in the early part of the seventeenth century, of an intercourse maintained between separated friends by means of two sympathetic magnetic compasses, whereby the indications on the dial given by one, were instantly made visible to the other.§

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* On the value of abstract science, see "Supplement," NOTE A.

† Mr. Stephen Gray, in a letter to Dr. Cromwell Mortimer, secretary of the Royal Society of London, dated February 8, 1731, recited among numerous electrical experiments, the passage of sparks and the excitation of an electroscope, effected through 293 feet of wire suspended by silk, in 1729; through 666 feet on July 3 of that year; a week or two later, through 765 feet; and in August, 1730, through 886 feet of wire. (*Phil. Trans. R. S.* 1731, vol. xxxvii, No. 417, pp. 29, 31, and 44.) These experiments were made however for the purpose of determining conductive capacity, without any view of employing the indications for signals.

A letter was published in the *Scots' Magazine*, dated Renfrew, February 1, 1753, and signed "C. M.," which, under the title "An expeditious method of conveying intelligence," proposed the suspension between two distant points of a number of insulated wires (equal to the number of letters in the alphabet), through which electrical discharges should separately exhibit themselves by the diverging balls of an electroscope, or the striking of a bell by the attraction of a charged ball. The author of the communication was supposed by Sir David Brewster to be a Charles Marshall, of Paisley. (*The Engineer*, London, Dec. 24, 1858, vol. vi., p. 484.) It is probable that G. L. Lesage, of Geneva, entertained the project of an electric telegraph as early as the middle of the last century. It was therefore rather the impulse of an age, than the inspiration of an individual.

‡ The application of magneto-electricity, presenting no essential differences from the use of galvano-electricity, (for which it is sometimes substituted,) requires no special notice. Still less noteworthy is the project of thermo-electricity as the motor.

§ *Prolusiones Academicæ:* by F. Strada, quarto, Rome, 1617, lib. ii, prolusio 6. A century later, (but still a third of a century before man dreamed of electric telegraphs,) Joseph Addison presented the following version of this fairy tale: "Strada, in one of his Prolusions, gives an account of a chimerical correspondence between two friends by the help of a certain loadstone which had such a virtue in it that if it

"Two faithful needles—from the informing touch
Of the same parent stone, together drew
Its mystic virtue;——
And though disjoined by kingdoms,—though the main
Rolled its broad surge betwixt,—and different stars
Beheld their wakeful motions,—yet preserved
Their former friendship and remembered still
The alliance of their birth." *

It needed but the later discovery of the galvanic wire for connecting the two needles, to realize completely this vision of an "oriental" fancy, and to render it the sober experience of our present every-day life.

I.—TELEGRAPHS BY ELECTRICITY.

If the earlier attempts commencing in the last century to apply so-called "static" electricity to the purpose of telegraphy may to some appear to possess only an antiquarian interest, it will be seen that they form the necessary, and by no means insignificant, childhood of our modern systems. Neglecting generally mere speculations, as well as initial conceptions of executed schemes, the following comprise the more important experimental devices, in the order of their approximate realization.

1774. The first electric telegraph of which there is record, is that established at Geneva by Georges-Louis Lesage. The line consisted of 24 insulated wires for the alphabet, each terminating in a pith-ball electroscope duly lettered, for indicating by its excitement the succession forming the words and sentences given by the operator, who employed at the transmitting station a manual conductor from an electrical machine. †

1787. M. Lomond, at Paris, had a single brass wire extended from one closed apartment to another at some distance from it, in connection with a pith-ball electroscope at each end, by which arrangement he was able to communicate sentences in either direction. Arthur Young, the diligent writer on natural and industrial resources, has thus described the apparatus in his journal: October 16, 1787,—"In the evening, to Mons.

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touched two several needles, when one of the needles so touched began to move, the other though at never so great a distance, moved at the same time and in the same manner. He tells us that the two friends being each of them possessed of one of these needles, made a kind of dial-plate, inscribing it with the four-and-twenty letters, in the same manner as the hours of the day are marked upon the ordinary dial-plate. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment, so as to touch any of the four-and-twenty letters. . . . By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas or deserts." (*The Spectator*, No. 241, Dec. 6, 1711.) A similar idea (probably borrowed from Strada) is found in Daniel Schwenter's *Mathematisch-philosophische Erquickungsstunden;* published at Nuremberg in 1636, pp. 346, 347.

*Akenside, *Pleasures of Imagination* (1744), book iii.

† Lesage, in a letter addressed to Prof. Pierre Prévost, of Geneva, dated Berlin, June 22, 1782, describing to his friend the details of his telegraph, states that the method of corresponding by means of electricity had been contemplated by him for thirty or thirty-five years. (*Traité de Télégraphie Électrique:* par l'Abbé Moigno, 2d edit. 8vo. Paris, 1852, part ii, chap. 1, p. 59.)

Lomond, a very ingenious and inventive mechanic, who has made an improvement of the jenny for spinning cotton. In electricity he has made a remarkable discovery. You write two or three words on a paper; he takes it with him into a room, and turns a machine inclosed in a cylindrical case, at the top of which is an electrometer,—a small fine pith ball; a wire connects with a similar cylinder and electrometer in a distant apartment; and his wife by remarking the corresponding motions of the ball, writes down the words they indicate. From which it appears that he has formed an alphabet of motions. As the length of the wire makes no difference in the effect, a correspondence might be carried on at any distance." *

1794. M. Reiser, at Geneva, arranged a line of 36 insulated wires, each separately connected at the receiving-station with a small grating of narrow tin-foil strips pasted on glass, from which a letter or figure had been cut, so as to represent the character by the passage of the electric spark over the series of narrow spaces. On a square plate were fastened 36 of these independent gratings, representing the 26 letters and 10 numerals. "The instant the discharge is made through the wire, the spark is seen simultaneously at each of the interruptions or breaks of the tin-foil constituting the letter, and the whole letter is rendered visible at once." The sparks were transmitted through the selected wire and its corresponding symbol from a small electrical machine kept in operation at the sending station.†

1795. Tiberius Cavallo, in England, experimented with electric signals of various kinds (explosive and otherwise) through a long and tolerably fine copper wire (about the fortieth of an inch in diameter) insulated by successive coatings of pitch, linen strips, woolen cloth, and oil-painting. He found a Leyden jar of about one square foot, sufficient for the required electric spark, if the length of the wire did not exceed 200 feet. He remarks: "By sending a number of sparks at different intervals of time according to a settled plan, any sort of intelligence might be conveyed instantaneously from the place in which the phial is situated. With respect to the greatest distance to which such communication might be extended, I can only say that I never tried the experiment with a wire of communication longer than about 250 feet; but from the results of those experiments, and from the analogy of other facts, I am led to believe that the above-mentioned sort of communication might be extended to two or three miles, and probably to a much greater distance."‡

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* *Travels during the years* 1787, 1788, *and* 1789, *in the Kingdom of France.* By Arthur Young. 2 vols. 8vo. Dublin, 1793, vol. i, p. 135. Of the work as republished in Pinkerton's *Collection of Voyages and Travels*, 4to. London, 1809, vol. iv, p. 139.

† Voigt's *Magazin*, etc. 1794, vol. ix, part 1, p. 183; also Moigno's *Télégraphie Électrique*, part ii, chap. 1, p. 61.

‡ *A Complete Treatise on Electricity*, in 3 vols. 8vo. London, 1795; vol. iii, note No. viii, pp. 295, 296. The first *two* volumes of this work had passed through three earlier editions.

1798. D. F. Salva, in Spain, appears to have successfully worked an electric telegraph through the unprecedented distance of twenty-six miles. "The *Madrid Gazette* of November 25, 1796, states that the Prince de la Paix, having heard that M. D. F. Salva had read to the Academy of Sciences a memoir upon the application of electricity to telegraphing, and presented at the same time an electric telegraph of his own invention, desired to examine it; when being delighted with the promptness and facility with which it worked, he presented it before the king and court, operating it himself. Some useful trials were made and published in *Voigt's Magazine*. Two years after, the Infanta Don Antonio constructed a telegraph of great extent on a large scale, by which the young prince was informed at night of news in which he was much interested. He also invited and entertained Salva at court. According to Humboldt, a telegraph of this description was established in 1798, from Madrid to Aranjuez, a distance of 26 miles."*

1816. Francis Ronalds constructed at Hammersmith, England, an experimental telegraph line of a single wire, operated by an electrical machine, or small Leyden jar. "He proved the practicability of such a scheme by insulating eight miles of wire on his lawn at Hammersmith. In this case the wire was insulated in the air by silk strings. . . . Mr. Ronalds fixed a circular brass plate upon the seconds arbor of a clock which beat dead seconds. This plate was divided into twenty equal parts, each division being worked by a figure, a letter, and a preparatory sign. The figures were divided into two series of the units, and the letters were arranged alphabetically, omitting J, Q, V, W, X, and Z. In front of this was fixed another brass plate (which could be occasionally turned round by hand), and which had an aperture that would just exhibit one of the figures, letters, and preparatory signs. In front of this plate was suspended a pith-ball electrometer from a wire which was insulated and which communicated on one side with a glass cylinder machine. At the farther end of the wire was an apparatus exactly the same as the one now described, and the clocks were adjusted to as perfect synchronism as possible. Hence it is manifest that when the wire was charged by the machine at either end, the electrometers at both ends diverged, and when it was discharged they collapsed at the same instant; consequently if it was discharged at the moment when a given letter, figure, and sign on the plate appeared through the aperture, the same letter, figure, and sign would appear also at the

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* *The Electro-Magnetic Telegraph*, by Laurence Turnbull, 8vo. 2d ed. Philada. 1853, pp. 21, 22. Voigt's *Magazin*, etc. vol. xi, part 4. The same telegraphic feat is attributed to Bétancourt. "Gauss makes mention of a communication from Humboldt, according to which Bétancourt, in 1798, established a communication between Madrid and Aranjuez, a distance of 26 miles, by means of a wire through which a Leyden jar used to be discharged, which was intended to be used as a telegraphic signal." (Sturgeon's *Annals of Electricity*, etc. March, 1839, vol. iii, p. 446.) This is probably a misapprehension; as Augustine Bétancourt (more correctly Bethencourt), a Spanish engineer, in 1798, devised and exhibited to the National Institute an improvement in the mechanical semaphore. (Brewster's *Edinburgh Encyclopædia*, 1830, art. "Telegraph," vol. xviii, p. 535.)

other clock; so that by means of such discharges at one station, and by marking down the letters, figures, and signs seen at the other, any required words could be spelt."*

"He also made the trial with 525 feet of buried wire. With this view he dug a trench four feet deep, in which he laid a trough of wood two inches square, well lined both within and without with pitch; and within this trough were placed thick glass tubes through which the wire ran. The junction of the glass tubes was surrounded with short and wider tubes of glass, the ends of which were sealed up with soft wax." This form of conductor was not found to operate very satisfactorily, and the inventor on theoretical grounds did not think such an arrangement adapted to the instantaneous electrical transmission required by his system.

Mr. Ronalds, in 1823, published a full account of his telegraph.† In 1871, very nearly half a century later, as Sir Francis Ronalds, he published a new edition of this interesting work; and a review of it in "Nature" gives this presentation of the scheme: "Sir Francis, before 1823, sent intelligible messages through more than eight miles of wire insulated and suspended in the air. His elementary signal was the divergence of the pith-balls of a Canton's electrometer, produced by the communication of a statical charge to the wire. He used synchronous rotation of lettered dials at each end of the line, and charged the wire at the sending end whenever the letter to be indicated passed an opening provided in a cover; the electrometer at the far end then diverged, and thus informed the receiver of the message which letter was designated by the sender. The dials never stopped, and any slight want of synchronism was corrected by moving the cover."‡

This very ingenious device of synchronous rotation at the opposite stations presents the earliest example of a dial telegraph, or of a letter indicator employing but a single wire. About forty years later, or in 1855, this system was successfully applied by Mr. David E. Hughes, of Kentucky, to a letter-printing telegraph of remarkable rapidity and accuracy.§

1828. "Harrison Gray Dyar, an American, constructed a telegraph in 1827–'28, at the race-course on Long Island, and supported his wires by glass insulators fixed on trees and poles. By means of common electricity acting upon litmus paper he produced a red mark. The difference of time between the sparks indicated different letters arranged in an ar-

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**Encyclopædia Britannica*, 7th ed. 1842, vol. viii, p. 662.—8th ed. 1854, vol. viii, p. 627.

†*Descriptions of an Electrical Telegraph; and some other Electrical Apparatus.* By Francis Ronalds. 8vo. London, 1823.

‡*Nature.* London, Nov. 23, 1871, vol. v, p. 59.

§A second type of dial telegraph was invented by Prof. Charles Wheatstone in 1839, in which the dial (or index) was rotated step by step by means of successive impulses of the current on an electro-magnet, which operated a toothed escapement on the axis of the dial or index;—the indicated letter or figure being stopped as long as desired. In this case, the character was determined solely by the number of electric impulses transmitted. This system was in 1846, made the basis of a highly original letter-printing telegraph, by Mr. Royal E. House, of Vermont; preceding that of Mr. Hughes, as will be observed, nearly ten years.

bitrary alphabet, and the paper was moved by the hand."* Mr. Dyar is described by Dr. Luther V. Bell as "a man of the highest inventive skill and scientific attainments." His experimental line (of a single wire) was several miles long; and the chemical record of the signals transmitted through it, was by the testimony of those who witnessed its operations, eminently distinct and satisfactory. The following is the account of his enterprise, given by the inventor himself in 1849, some twenty years afterward:

"I invented a plan of a telegraph which should be independent of day or night or weather, which should extend from town to town or city to city, without any intermediary agency, by means of an insulated wire in the air, suspended on poles, and through which wire I intended to send strokes of electricity in such a manner as that the diverse distances of time separating the divers sparks should represent the different letters of the alphabet and stops between the words, etc. This absolute or this relative difference of time between the several sparks I intended to take off from an electric machine by a little mechanical contrivance regulated by a pendulum, and the sparks were intended to be recorded upon a moving or a revolving sheet of moistened litmus paper, which by the formation of nitric acid by the spark in the air in its passsage through the paper, would leave a red spot for each spark on this blue test-paper. . . . To carry out my invention I associated myself with a Mr. Brown, of Providence, who gave me certain sums of money to become associated with me in the invention. We employed a Mr Connel, of New York, to aid in getting the capital wanted to carry the wires to Philadelphia. Thiis we considered as accomplished: but before beginning upon the long wire, it was decided that we should try some miles of it on Long Island. Accordingly I obtained some fine card wire, intending to run it several times around the race-course on the Island. We put up this wire (that is, Mr. Brown and myself) at different lengths, in curves and straight lines, by suspending it from stake to stake and tree to tree until we concluded that our experiments justified our undertaking to carry it from New York to Philadelphia. At this moment our agent brought a suit or summons against me for 20,000 dollars for agencies and services, which I found was done to extort a concession of a share of the whole project." Failing in this prosecution, the unprincipled agent obtained a writ against the two partners on a charge of conspiracy to carry on secret communication between the cities! and he thus effectually put an end to the enterprise, without the formality of a judicial trial on this novel accusation.†

These practical illustrations of early electric telegraphy, including successful workings of both the dial and the chemical forms of the telegraph without the use of galvanism, serve to show that the agency is by

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*Turnbull's *Electro-Magnetic Telegraph*, 8vo. Philadelphia, 1st ed. 1852, p. 6; 2d ed. 1853, p. 22.

†Prescott's *Hist. Electr. Telegraph*, 1860, chap. xxi, pp. 427, 428.

no means the trivial and inefficient one so often represented by modern writers. On the contrary, but for the practical difficulty of perfect and constant insulation, owing to the intense self repulsion of mechanical electricity and the reaction and retardation from induction currents in long lines of coated wire, this method would really constitute an economical and satisfactory medium of distant communication.

Steinheil in reference to this subject remarks: "All these experiments put it beyond a doubt that frictional electricity may be employed for giving signals at any distances, and that when these signals are properly contrived they offer convenient means of telegraphic intercourse. Frictional electricity has besides as Gauss has already observed, the great advantage of not losing any of its force by increasing the length of the conducting wire, inasmuch as the whole of the electricity of one coating of the jar must traverse the entire length of the wire (be it what it may) to neutralize that of the other coating." *

II.—TELEGRAPHS BY GALVANISM.

The introduction of the galvanic battery by Volta at the commencement of the present century† led many to experiment with its peculiar current as a means of telegraphing. The only practicable forms of simple galvanic telegraphs, are those whose indications are given by chemical decompositions, and which thus form the class commonly known as the "electro-chemical"; and as these chemical indications usually leave permanent markings, the class is also one of *recording* telegraphs.

1808. Dr. Samuel Thomas von Sœmmering, of Munich, appears to have been the first to apply Volta's invention to this purpose. "As long ago as in 1807, Sœmmering erected in the apartments of the Academy of Sciences at Munich a galvanic telegraph, of which he has published a detailed description in the Philosophical Transactions of Bavaria. [*Münchner Denkschriften der Königlichen Akademie der Wissenschaften für* 1809, 1810. Math. phys. Classe, p. 401.] He employed the energy of a powerful voltaic pile to bring about the decomposition of water by means of thirty-five gold pins immersed in an oblong glass trough."‡ Each of these gilt electrodes was in connection with one of the thirty-five wires forming the line, and was covered with an inverted test-tube filled with water, resting on a submerged shelf in the oblong trough, as a gas-receiver. These small receivers with their inclosed gilt pins or electrodes arranged in a row, represented 25 letters and 10 numerals. Such being the disposition at the receiving end, the thirty-five line wires at the transmitting end were each secured to a separate perforated brass plate. On connecting the

* Sturgeon's *Annals of Electricity*, etc. March 1839, vol. iii, p. 446.

† Volta's description of his battery is given in a "Letter to Sir Joseph Banks," president of the Royal Society of London. (*Phil. Trans. R. S.* read June 26, 1800, vol. xc, pp. 403–431.)

‡ Sturgeon's *Annals of Electricity*, etc. Mar. 1839, vol. iii, p. 447.

respective poles of the battery with any two of the line wires by means of two attached metallic pins held in the hands and inserted in the holes of their terminal plates, the current was established, and bubbles of hydrogen and oxygen were at once evolved in the corresponding lettered tubes. A system of syllabic communication and reading was provided, in which the hydrogen element should be first noted.*

Very shortly after his first successful working of this telegraph, Sœmmering interposed in the galvanic circuit two thousand feet of insulated wire, wound around a glass cylinder, without impairing his decompositions. He found no appreciable retardation in the action of the electrodes. "The evolution of the gas through this considerable length of wire appeared to begin as quickly as if the effect had only to traverse two feet."†

In an "Historical account of the introduction of the galvanic and electro-magnetic telegraph" presented to the Imperial Academy of Sciences at St. Petersburg, by Dr. Hamel, of that city, a very full and interesting narrative is given of Sœmmering's experiments, compiled from original documents;‡ from which the following extracts are made:

"On the 22d of July, 1809, his apparatus was already so far advanced that it was fit to work. He however went on making still further improvements, and it was only on the 6th of August that he considered the telegraph quite completed. He was much pleased with its performance, being able to work through 724 feet of wire. . . . Two days later, he could already telegraph through 1,000 feet, and on the 18th of August through as much as 2,000 feet of wire. On the 29th of August he exhibited the telegraph in action before a meeting of the Academy of Sciences in Munich." A year later he first effected a satisfactory arrangement of premonitory alarm or attention call. "On the 23d of August, 1810, Sœmmering succeeded in inventing a contrivance for sounding an alarm, which answered perfectly well." (p. 596.)

"In September, 1811, Sœmmering simplified his telegraph considerably; he reduced the number of wires in his conducting cord from 35 to 27. . . . On the 1st of February, 1812, Prince Karl Theodor, the second son of King Maximilian I, honored Sœmmering with a visit to see the telegraph. On the 4th of February, 1812, Sœmmering announced that he was able to telegraph through 4,000 feet of wire, and on the 15th of March he telegraphed even through 10,000 feet." (p. 597.) This was nearly two miles of wire, but wound on reels.

This complex and inconvenient arrangement of signaling by the decomposition of water, would hardly seem to offer a practical method of telegraphy. Yet the system was earnestly prosecuted by its inventor for

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* Schweigger's *Journal für Chemie und Physik*, 1811, vol. ii, part 2, pp. 217–213: (from the *Memoirs* of the "*Königliche Akademie der Wissenschaften*," at Munich, 1810.) Also, *Polytechnisches Central-Blatt*, June, 1838, Jahrgang iv, b. i, pp. 482–484.

† *Münchner Denkschriften der Königlichen Akademie der Wissenschaften* für 1812. In this experiment, the self-induction of the conducting coil probably increased somewhat the effect.

‡ *Journal of the Society of Arts*, London, July 22, and 29, 1859, vol. vii, No. 348, pp. 595–599, and No. 349, pp. 605–610.

many years, and attracted considerable attention; and had no simpler device been discovered it might possibly have won its way into use. It is remarkable that some seven or eight years later a Philadelphian independently proposed the same scheme.

1816. Dr. John Redman Coxe, of Philadelphia, professor of chemistry in the University of Pennsylvania, suggested the employment of wires for communicating intelligence by a galvanic current, arranged either to decompose water in tubes, (Sœmmering's plan, of which he seems to have been unaware,) or to decompose metallic salts.* As an untried suggestion, this has been noticed only because the latter project was afterward successfully developed and executed by others.

1828. Victor Triboaillet de Saint Amand proposed to establish a galvanic telegraph line of a single wire from Paris to Brussels, the conducting wire to be varnished with shellac, wound with silk, coated with resin, inclosed in sections of glass tube carefully luted with a resin, the whole substantially wrapped and water-proofed, and finally to be buried some feet deep in the earth. The signaling device is somewhat obscure, as while a strong battery is the source of the current, the receiving instrument is an electrometer.† This project, also belonging to the purely speculative class, scarcely deserves a notice.

1843. Mr. Robert Smith, of Blackford, Scotland, devised an experimental galvano-chemical telegraph carrying out practically the suggestion offered by Dr. Coxe in 1816. A set of iron type at the receiving station, each connected by separate wires with a corresponding circuit-key at the transmitting station, was so arranged with reference to a clock-moved band of paper wet with a solution of ferro-cyanide of potassium, that when the current was passed through any special circuit, it impressed a blue letter on the band. "A paper containing an account of this telegraph was read before the Royal Scottish Society of Arts on the 27th of March, 1843; reported on by a committee, and approved the 12th of June following. Since that time many trials have been made, and various improvements in its construction have also been introduced by the inventor."‡

Two or three years later Mr. Smith reduced his line to a single circuit of two wires; and the registering device at the receiving station consisted of a fillet or ribbon of plain calico wound on a roller placed in a trough filled with a solution of ferro-cyanide of potassium containing a few drops of nitric acid, and unrolled by the motion of clock-work over a leaden cylinder with which one of the iron wires of the line was in connection, while the end of the other iron wire rested on the wetted

*Thomson's *Annals of Philosophy*, Feb. 1816, vol. vii, p. 162.

† *Report of Academy of Industry*, Paris. Quoted from A. Vail's *Electro-Magnetic Telegraph*, 1845, p. 135. Also Turnbull's *Electro-Magnetic Telegraph*, 2d ed. 1853, p. 56.

‡ *Practical Mechanic and Engineer's Magazine*, Glasgow, Nov. 1845, vol. i, 2d series, p. 36.

calico immediately over the cylinder. On every completion of the circuit at the transmitting station, a blue mark was thus imprinted on the moving cloth by the electrical decomposition, and the succession of marks of differing lengths and intervals formed the system of signals. This telegraph was found to work satisfactorily through eighteen hundred yards of wire fence.*

1846. Mr. Alexander Bain, of Edinburgh, obtained an English patent for a galvano-chemical telegraph, which while exhibiting considerable ingenuity in its mechanical devices, imitated very closely in its chemical record the previous system of Smith. "The chemical solution preferred for the preparation of the paper consists of sulphuric acid and a solution of prussiate of potassa."†

1849. Prof. Samuel F. B. Morse, of New York, obtained an American patent for a galvano-chemical telegraph, also very similar to that of Smith, employing like him a single circuit, and specifying, among several metallic salts which might be used, solutions of iodide of potassium, of iodide of tin, and of acetate of lead, with nitrate of potassa. The inventor added: "I wish it to be understood that I do not confine myself to the use of the substances I have mentioned, but mean to comprehend the use of any known substance already proved to be easily decomposed by the electric current."‡

III.—TELEGRAPHS BY GALVANO-MAGNETISM.

Meanwhile the rapid awakening of attention among physicists to the magnetic relation of the galvanic current, and the production of the galvanometer, at once indicated a new and promising method of signaling to a distance by galvanic agency.

The Galvanometer.—In 1820, Hans Christian Oersted, professor of natural philosophy at Copenhagen, announced through various European journals his discovery that if a straight conjunctive wire through which a galvanic current is passing "be placed horizontally above the magnetic needle and parallel to it . . . the needle will be moved, and the end next the negative side of the battery will go westward. . . . If the uniting wire be placed in a horizontal plane *under* the magnetic needle all the effects are the same as when it is above the needle, only they are in an opposite direction."§

Although the directive influence of a galvanic conductor on a mag-

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* *Practical Mechanic and Engineers' Magazine*, June, 1846, vol. i, 2d series, pp. 239, 240.

† *English patent* of A. Bain, Dec. 12, 1846, No. 11480.

‡ *American patent* of S. F. B. Morse, May 1, 1849, No. 6420.

§ Thomson's *Annals of Philosophy*, Oct. 1820, vol. xvi, pp. 274, 275. (Also, *Journal de Physique*, etc. 1820, vol. xci, pp. 72–76; *Annales de Chimie et de Physique*, 1820, vol. xiv, pp. 417–425; *Bibliothèque Universelle des Sciences*, etc. 1820, vol. xiv, pp. 274–284; *Annales Générales des Sciences Physiques*, 1820, vol. v, pp. 259–264; Gilbert's *Annalen der Physik*, 1820, vol. lxvi, pp. 295–304; Schweigger's *Journal für Chemie und Physik*, 1820, vol. xxix, pp. 275–281; *Giornale Arcadico di Scienze*, etc. 1820, vol. viii, pp. 174–178; Brugnatelli's *Giornale di Fisica*, etc. 1820, pp. 335–342.)

netic needle, was observed and announced by a Italian savant, Gian Domenico Romagnosi, of Trent, at the beginning of the present century, (shortly after the production of the galvanic battery by Volta,) this important phenomenon attracted no attention, and produced no results, until it was republished two decades later by the Danish physicist.*

In the same year—almost immediately after Oersted's announcement, Prof. Johann S. C. Schweigger, of Halle, made a great improvement on his galvano-magnetic indicator (of a single wire circuit), by giving the insulated wire a number of turns around an elongated frame longitudinally inclosing the compass-needle, and by thus multiplying the effect of the galvanic circuits upon the sensibility of the needle converted it into a real *measuring* instrument,—a "galvanometer."†

This delicate indicator at once suggested a new mode of galvanic telegraphing. In a memoir read to the "Royal Academy of Sciences," at Paris, October 2, 1820, André Marie Ampère, affirming "the possibility of deflecting a magnetic needle at a great distance from the pile, through a very long conducting wire," remarked: "This experiment, suggested to me by the illustrious Laplace, was completely successful. . . . From the success of the experiment" he added, "it is feasible by means of as many conducting wires and magnetic needles as there are letters, (each letter being assigned to a separate needle,) and by help of a battery at a distance, with its poles alternately connected with the extremities of each conductor, to establish a kind of telegraph adapted to transmit over intervening obstacles whatever information may be desired to the person observing the letters of the needles. A set of keys near the battery, bearing corresponding letters and making connection by their depression, would offer a facile means of correspondence; re-

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*As early as 1802, eighteen years before Oersted's discovery, M. Romagnosi, a publicist and physicist of Trent, observed the deflection of the magnetic needle when placed near a parallel conductor of the galvanic current. An account of this discovery was published in the *Gazzétta di Trento*, August 3, 1802. See "Supplement," NOTE B.

†"Additions to Oersted's Electro-magnetic Experiments," a memoir read at the *Naturforschenden Gesellschaft* at Halle, September 16 and November 4, 1820. An abstract of this paper was published in the *Allgemeine Literatur-Zeitung* of Halle, (4to,) November, 1820, No. 296, vol. iii, col. 621–624. The full memoir appeared in the *Journal für Chemie und Physik*, 1821, vol. xxxi, pp. 1–17; and "Additional Remarks," etc. by Dr. Schweigger, in the same volume, pp. 35–41.

A galvanometer of somewhat different form, having a vertical helix and employing an unmagnetized needle, was very shortly afterward independently devised by Johann Christian Poggendorff, of Berlin; and as he preceded Schweigger in publishing an account of it, he is sometimes regarded as the original inventor. (*Edinburgh Philosophical Journal*, July, 1821, vol. v, p. 113.) Schweigger designated his device an "Electro-magnetic Multiplicator"; Poggendorff designated his arrangement a "Galvano-magnetic Condensator." Professor Oersted remarks, "Immediately after the discovery of electro-magnetism, M. Schweigger, professor at Halle, invented an apparatus admirably adapted for exhibiting by means of the magnetic needle, the feeblest electric currents. . . . M. Poggendorff, a distinguished young savant of Berlin, constructed an electro-magnetic multiplier very shortly after M. Schweigger, with which he made some striking experiments. M. Poggendorff's work having been cited in a book on electro-magnetism by the celebrated M. Ernan, (published immediately after the discovery of these phenomena,) became known to several philosophers before that of M. Schweigger." (*Annales de Chimie et de Physique*, 1823, vol. xxii, pp. 358–360.)

quiring only the time to touch each key at the one station, and to read each letter at the other."*

Ingenious as this early proposal of an electro-magnetic telegraph appears, it really presents essentially but the substitution of the new-found galvanometer for the old electrometer at the receiving station, as first employed by Lesage, nearly half a century previously.

1823. The first to develop practically, Ampère's suggestion of a galvanometer telegraph, was the Russian Baron Paul Ludovitsch Schilling, of Cronstadt. The personal friend of Sœmmering, he became from an early date warmly interested in the galvanic telegraph; and not long after Schweigger's invention of the galvanometer, he appears to have commenced his experiments in the direction pointed out by Ampère. His countryman, the venerable Dr. Hamel, of St. Petersburg, who enjoyed his acquaintance, gave in 1859, in his "Historical account of the introduction of the galvanic and electro-magnetic Telegraph," the following interesting particulars of Schilling's early associations and pursuits:†

"At the time when Sœmmering became a member of the Academy of Sciences at Munich, in 1805, there was attached to the Russian embassy in that capital, the Baron Pavel Ludovitsch Schilling, of Cronstadt. About a year after the invention of the telegraph [by the former] Schilling saw experiments performed with it. He was so forcibly struck with the probability of a very great usefulness of the invention that from that day galvanism and its applications became one of his favorite studies."

"In the spring of 1812, Baron Schilling was endeavoring to contrive a conducting cord sufficiently insulated that it might convey the galvanic current not only through wet earth, but also through long distances of water. The war then impending between France and Russia made Baron Schilling desirous of finding a means by which such a conducting cord should serve for telegraphic correspondence between fortified places and the field, and likewise for exploding powder mines across rivers. . . . In the autumn of 1812, he actually exploded powder mines across the river Neva, near St. Petersburg. . . . Baron Schilling has told me that during his stay at Paris, he with his subaqueous conductor, several times (to the astonishment of the lookers-on) ignited gunpowder across the river Seine."

"On the 29th of December, 1815, there came to pay his respects to Sœmmering (while Baron Schilling was just with him) the well-known natural philosopher Johann Salomon Chistian Schweigger, then professor of natural philosophy and chemistry at the Physico-technical Institute at Nuremberg, who was on his way to Paris and London: (in which

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* *Annales de Chimie et de Physique*, 1820, vol. xv, pp. 72, 73.

† The writer states: "Letters show that the cordial friendship between Sœmmering and Baron Schilling continued unchanged to the time of his decease in 1830." Schilling died August 7, 1837. Dr. Hamel himself had the fortune to be personally acquainted with Oersted, Schweigger, Ampère, Aragǫ, Sœmmering, Schilling, and other electro-magnetic and telegraphic celebrities.

latter place I had afterward the pleasure of making his acquaintance.) . . . Baron Schilling having made at Sœmmering's the acquaintance of Schweigger, of course could not foresee that one day an invention of this gentleman, the 'multiplier,' would enable him to make at St. Petersburg, the first electro-magnetic telegraph."*

It is impossible, in the scarcity of documentary evidence, to ascertain at what date Schilling's long contemplated project of a galvanometer telegraph (designed as an improvement on the galvanic telegraph of his friend Sœmmering) was first reduced to a practical or working form: but it was at least as early as the year 1823, when Schilling constructed at St. Petersburg an electro-magnetic telegraph apparatus whose signals were produced by five galvanometer needles, each provided with its own independent galvanic circuit. Schilling was enabled to effect his great simplification of an original alphabet of circuits, by the ingenious expedient of giving to each needle a positive and negative motion by means of reversed currents, and then of combining two or more of these signals. Whether this was really Schilling's first form of apparatus is very doubtful; but it is at least certain that he exhibited an operative instrument before the Emperor Alexander in 1824, or in 1825.†

Dr. Hamel remarks: "It was reserved for Baron Schilling at St. Petersburg to make the first electro-magnetic telegraph. Having become (as we know) through Sœmmering, at Munich, passionately fond of the art of telegraphing by means of galvanism, he now used for it the deflection of the needle, which he placed within the 'multiplier' of Schweigger horizontally on a light vertical axle hanging on a silken thread, and bearing a circular disk of paper colored differently on each side. . . . By degrees he simplified the apparatus. For a time he used five needles, and at last he was able to signalize even with one single needle and multiplier, producing by a combination of movements in the two directions, all the signs for letters and numbers. Having known Sœmmering's alarum, Schilling invented one for his telegraph also. His success in bringing his instruments to a high state of perfection would have been much more rapid had his time not been so much occupied with various duties, and particularly with the founding and directing of a large lithographic establishment for the Russian Government. Baron Schilling's telegraph was an object of great curiosity at St. Petersburg; it was frequently exhibited by him to individuals and to parties. Already the Emperor Alexander I, had been pleased to notice it in its earlier stage, and when it was reduced to great simplicity, his Majesty the Emperor Nicholas honored Baron Schilling on the 13th of March, 1830, with a visit at his lodgings in Opotchinin's house, in the Konooshennaja, to see experiments performed with it through a great length of conducting wires. . . .

"In May of the last-mentioned year (1830) Baron Schilling undertook a journey to China. . . . After his return from the borders of China to

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*_Journal of the Society of Arts_, July 22, 1859, vol. vii, pp. 597, 598.

†The Emperor Alexander died in 1825.

St. Petersburg, in March, 1832, Baron Schilling occupied himself again with the telegraph, and in May, 1835, he undertook a journey to the west of Europe, taking his simplified instrument with him. In the month of September he attended the meeting of the German physicists at Bonn on the Rhine, where on the 23d he exhibited his telegraph before the section of natural philosophy and chemistry, over which Professor Georg Wilhelm Muncke, of the University of Heildelberg, presided. Muncke was much pleased with Schilling's instrument, and he determined at once to get one for exhibition at his lectures. I have lately found at Heidelberg . . . in a store-room, the apparatus which Professor Muncke got made in imitation of the one exhibited by Baron Schilling at Bonn." *

The conflicting accounts of Schilling's system given at a later date appear to refer to instruments constructed at different periods. Thus it is said that in the latter part of 1832 [!] he used a "certain number of platinum wires insulated and united in a cord of silk, which put in action, by the aid of a species of key, 36 magnetic needles, each of which was placed vertically in the center of a multiplier. M. de Schilling was the first who adapted to this kind of apparatus an ingenious mechanism suitable for sounding an alarm, which when the needle was turned at the beginning of the correspondence, was set in play by the fall of a little ball of lead which the magnetic needle caused to fall. This telegraph of M. de Schilling was received with approbation by the Emperor, who desired it established on a larger scale: but the death of the inventor postponed the enterprise indefinitely." †

It is also stated in another account, that Schilling exhibited his telegraphic instruments before the Emperor Alexander. "In order to apprise the attendant before the commencement of a telegraphic dispatch, Schilling set off an alarm. How much of his apparatus belongs properly to the Baron Schilling, or whether a part of it was not an imitation of that of Gauss and Weber, is not for the editor to decide; but that Schilling had already experimented (probably with a more imperfect apparatus) before the Emperor Alexander, and subsequently before the Emperor Nicholas, is affirmed by the authorities adduced." The account describes the communications as consisting of signs devised from the various combmations of the right and left deflections of the single nee-

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* *Journal of the Society of Arts*, July 29, 1859, vol. vii, pp. 606, 607. The apparatus above referred to, is noteworthy as being that seen by Mr. William Fothergill Cooke on attending one of the lectures by Professor Muncke, at Heidelberg, March 6, 1836, on the electro-magnetic telegraph; and which apparatus he proceeded immediately to have reproduced. Returning to London April 22, of the same year, Mr. Cooke, (in conjunction with Professor Wheatstone,) succeeded by his energy in introducing the needle telegraph into England: and thus Schilling's great invention became transplanted from St. Petersburg to London, without either of its English introducers having any idea of its true origin. As Dr. Hamel remarks: "Mr. Cooke, who had never occupied himself with the study either of natural philosophy in general, or of electricity in particular, did not at all get further acquainted with Professor Muncke. He did not even acquire his name properly; he calls him Möncke. He had no idea that the apparatus he had seen had been contrived by Baron Schilling in Russia."

† *Report* of the "Academy of Industry," Paris, February, 1839.

dle.* It must evidently have been at a later date than 1825 when Schilling reduced his telegraph line to a single circuit of two wires and employed but a single galvanometer. Whether Schilling or Gauss was the original inventor of that most important improvement in galvanic telegraphy, the simplification and reduction of the line of communication to a single circuit cannot now perhaps be definitely determined;† but that the credit belongs to Schilling seems highly probable. That Schilling first invented and constructed a practical and operative electro-magnetic telegraph apparatus is placed beyond dispute; although the historical evidences of actual date are somewhat obscure. It is remarkable that although Schilling's early experimental telegraph was widely exhibited, and to numbers of distinguished visitors, no contemporary publication of its character or construction was made; and the invention was unknown to Western Europe for a dozen years later.‡

Thus, in 1829, Gustav Theodor Fechner, of Leipsic, evidently quite unaware of Schilling's labors—years before, wrote in a text-book on Galvanism: "There is no doubt that if the insulated wires of twenty-four multipliers, representing the letters of the alphabet (situated in Leipsic, for example), were conducted underground to Dresden, where should be placed a battery, we would have thereby a medium of communication probably not very expensive, through which intelligence could be instantaneously transmitted from one city to another."§

And in the year following, 1830, Dr. William Ritchie, at London, in a lecture before the Royal Institution on the evening of February 12, exhibited a working model of a telegraph provided with 26 circuits of wire for the several letters of the alphabet, "Mr. Ritchie concluded by exhibiting the electro-magnetic telegraph proposed by Ampère, by means of which, rapid communication might be carried on between towns in every state of the weather. The lecturer concluded by observing that in the present state of the inquiry, we cannot pronounce with absolute certainty with regard to the success of this ingenious project."‖

The Electro-Magnet.—But almost simultaneously with the birth of the galvanometer, this fertile agent—electricity—developed a new and no less

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* *Polytechnisches Central-Blatt*, June, 1838, Jahrgang iv. b. i, p. 486.

† One of the foremost of telegraphic inventors, and the personal friend of Gauss, Steinheil himself, speaks thus uncertainly on this subject: "The experiments instituted by Schilling by the deflection of a single magnetic needle, seem much better contrived [than Ampère's plan of an alphabet of wires, adopted by Mr. Davy and others]; he did not, however, succeed in surmounting the mechanical difficulties that attend the question in this shape . . . Gauss, and probably in imitation of him, Schilling . . . made use of but a single wire running to the distant station and back." (Sturgeon's *Annals of Electricity*, etc. March, 1839, vol. iii, pp. 448 and 450.)

‡ In 1835, Schilling, assisted by Baron Jacquin and Professor Ettingshausen, experimented with telegraph wires extended over the houses and across the streets of Vienna, preferring air lines to conductors laid in the earth. In 1837, Schilling ordered at a rope manufactory in St. Petersburg the necessary length of an insulated submarine cable, for the purpose of connecting telegraphically that capital with Cronstadt, through a portion of the Gulf of Finland; the distance between the two cities being twenty miles. His death which occurred August 7, 1837, arrested the enterprise.

§ *Lehrbuch des Galvanismus*, etc. by G. F. Fechner, 8vo. Leipzig, 1829, p. 269.

‖ *The Quarterly Journal* of the Roy. Inst. of Gr. Brit. Mar. 1830, vol. xxix, p. 185.

marvelous progeny. In the same year, 1820, Dominique François Arago, of Paris, announced, "On repeating the experiments of the Danish physicist, I have observed that the same current will *develop* strongly in strips of iron or steel, the magnetic power. . . . The conjunctive wire communicates to soft iron but a momentary magnetization; but to small pieces of steel it gives frequently a permanent magnetism. I have been able thus to completely magnetize sewing-needles."*

This germ of a new power required, as usual, the successive labors of more than one philosophic investigator to develop fully its capacities. To William Sturgeon, of Woolwich, England, belongs the distinguished honor (too little appreciated by his countrymen) of giving to the scientific toy of Arago a suitable form, and thus of first producing in 1824, the true electro-magnet with its intermittent control of an armature. Dispensing with the glass tube of Arago, Sturgeon constructed a horse-shoe bar of soft iron (after the form of the usual permanent magnet), which he coated with a non-conducting resinous varnish. Then winding a copper wire in a loose coil directly about the limbs of the horse-shoe, on bringing the ends of the wire in connection with the poles of a single galvanic pair of moderate size, he found his temporary magnet capable of sustaining several pounds by its armature; and on breaking the circuit, becoming instantly powerless.

It resulted from the correlative function of the galvanic current in directing transversely a permanently magnetized needle (first discovered by Romagnosi and Oersted), or in inducing temporary magnetism in iron thus transversely placed (first discovered by Arago and Sturgeon), that two distinct methods of signaling were offered by this new agency, accordingly as a permanent or a temporary magnet were employed. In the former case, the determined oscillations of the *magnetic bar*, by means of intermittent currents in a surrounding coil, would form the indicating device; and in the latter case, the determined oscillations of the *armature*, by means of intermittent currents in the coil surrounding its associated magnet, would give the indication. Hence the two types of electro-magnetic telegraph; the magnetic-needle system, and the magnetic-armature system.†

On experimenting with the galvanometer needle, it was very soon discovered that it responded only to variations of surface action in a single pair of galvanic elements, and that a large number of galvanic cells (as in the Cruickshanks battery), having even a greater total surface of oxi-

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* *Annales de Chimie et de Physique*, 1820, vol. xv, pp. 93, 95, Arago's method of experimentation consisted in winding the wire connecting the poles of the battery, around a glass tube in a loose helix, within which tube small pieces of iron or steel were placed. Sir Humphrey Davy, of England, not long afterward, also magnetized steel-needles by galvanism; and even effected the result with ordinary electricity from a Leyden-jar battery. (*Annals of Philosophy*, August, 1821, vol. ii, n. s. pp. 81–88.) This was the germ—though scarcely more than the germ—of the electro-magnet. For a notice of early anticipations of electro-magnetism, see "Supplement," NOTE C.

†A modification of the latter system, by which the oscillations of an armature are superseded by the variable attraction between the magnetized core and its hollow galvanic coil, might perhaps be considered as forming a third type—that of the "axial" magnet. This has been employed in House's printing telegraph.

dation, produced but a comparatively small declination of Schweigger's needle. In fact, no multiplication of galvanic elements was successful in increasing the deflection of a given galvanometer. On the other hand, the same galvanometer was found to have its deflections greatly reduced with every increase in the length of the interposed circuit. And here again an increase of surface in the galvanic pair failed to overcome the increased resistance of a lengthened conductor. There was also an early limit found to the number of turns in the galvanometer coil, which could be efficiently employed with any given surface of oxidizable metal in the single galvanic element.

In 1824, Peter Barlow, the eminent English mathematician and magnetician, taking up Ampère's suggestion, endeavored more fully to test its practicability. He has thus stated the result: "In a very early stage of electro-magnetic experiments, it had been suggested that an instantaneous telegraph might be established by means of conducting wires and compasses. The details of this contrivance are so obvious, and the principle on which it is founded so well understood, that there was only one question which could render the result doubtful; and this was, is there any dimunition of effect by lengthening the conducting wire? It has been said that the electric fluid from a common [tin-foil] electrical battery had been transmitted through a wire four miles in length without any sensible diminution of effect, and to every appearance instantaneously; and if this should be found to be the case with the galvanic circuit, then no question could be entertained of the practicability and utility of the suggestion above adverted to. I was therefore induced to make the trial; but I found such a sensible diminution with only 200 feet of wire, as at once to convince me of the impracticability of the scheme. It led me however to an inquiry as to the cause of this diminution and the laws by which it is governed."*

From the rapid reduction of effect observed with increasing lengths of conjunctive wire under the conditions tried, Barlow (from a considerable series of experimental results) was led to believe that the resistance of the conducting wire is approximately proportional to the square root of its length.†

Notwithstanding therefore Ampère's "completely successful" experiment "through a very long conducting wire" and Schilling's later working of his telegraph "through a great length of wires," (the precise length of the circuit not being stated in either case,) the problem of the electro-magnetic telegraph could hardly be considered as satisfactorily solved for any practical purposes of communicating to great distances. In the deliberate judgment of one of the most eminent of English phys-

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* "On the laws of electro-magnetic action." *Edinburgh Philosophical Journal*, Jan. 1825, vol. xii, p. 105.

† Pp. 110, 111 of the Journal just cited. Later experiments under varied conditions have shown that Ohm's law (announced three years after Barlow's) of a simple ratio of resistance to length is approximately correct.

icists in this special department, careful experiment only tended to show "the impracticability of the scheme."

It is at this point that there appears a new explorer in the electro-magnetic field; a field from which apparently all the laurels had been already gathered. Joseph Henry, elected to the professorship of mathematics and natural philosophy in the Albany Academy, of New York, in 1826, commenced very shortly afterward his scientific investigations. Sturgeon, in 1824, had pointed out the proper manner of making an "electro-magnet," and had also greatly improved lecture-room apparatus for illustrating the torsional reaction between a permanent magnet and a galvanic circuit when either is made movable. By introducing in such cases a larger and more powerful magnet he had succeeded in exhibiting the usual phenomena on a larger scale with a considerable reduction of the battery power.*

Henry was enabled by his skillful experimental investigations to exhibit all the class illustrations attempted by Sturgeon, not only on a still larger and more conspicuous scale, with the use of feeble magnets (where required), but with a still further reduction of the battery power. And he moreover carried out the same results to other cases where an artificial magnet is inapplicable, as for example, in the illustration of Ampère's fine discovery of the mutual action of two electric currents on each other, or of the influence of the terrestrial magnetism on a current, as in Ampère's swinging galvanic ring, or the floating ring of De La Rive. These very striking and unexpected results were obtained by the simple expedient of adopting in every case where single circuits had previously been used, the manifold coil of fine wire which Schweigger had employed to increase the sensibility of the galvanometer.

The coils employed by Henry in the various articles of apparatus thus improved, comprised usually about twenty turns of fine copper wire wound with silk to prevent metallic contact, the whole being closely bound together. To exhibit for instance Ampère's ingenious and delicate experiment showing the directive action of the earth as a magnet on a galvanic current when its conductor is free to move, (usually a small wire frame or ring, of a few inches in diameter, with its extremities dipping either into mercury cups or into mercury channels,) the effect was strikingly enhanced by Henry's method of suspending by a silk thread a large circular coil, 20 inches in diameter, of many wire circuits bound together with ribbon,—the extremities of the wire protruding at the lower part of the hoop, and soldered to a pair of small galvanic plates;—when by simply placing a tumbler of acidulated water beneath, the hoop

* *Transactions of the Society for the encouragement of Arts*, etc. 1825, vol. xliii, pp. 38-52. Sturgeon's battery (of a single element) consisted "of two fixed hollow concentric cylinders of thin copper, having a movable cylinder of zinc placed between them. Its superficial area is only 130 square inches, and it weighs no more than 1 lb. 5 oz." Mr. Sturgeon was deservedly awarded the silver medal of the Society for the Encouragement of Arts, &c. "for his improved electro-magnetic apparatus." The same is described also in the *Annals of Philosophy*, Nov. 1826, vol. xii, n. s. pp. 357–361.

at once assumed (after a few oscillations) its equatorial position transverse to the magnetic meridian. Such was the character of demonstration by which the new Professor was accustomed to make visible to his classes the principles of electro-magnetism. And it is safe to say that in simplicity, efficiency, and conspicuous distinctness, such apparatus for the lecture-room was far superior to any of the kind then existing.

The details of this early contribution to electrical science were set forth in a communication read by Henry before the Albany Institute October 10, 1827, "On some modifications of the electro-magnetic apparatus." In this paper he remarks:

"Mr. Sturgeon, of Woolwich, who has been perhaps the most successful in these improvements, has shown that a strong galvanic power is not essentially necessary even to exhibit the experiments on the largest scale. . . . Mr. Sturgeon's suite of apparatus, though superior to any other as far as it goes, does not however form a complete set; as indeed it is plain that his principle of strong magnets cannot be introduced into every article required, and particularly into those intended to exhibit the action of the earth's magnetism on a galvanic current, or the operation of two conjunctive wires on each other. To form therefore a set of instruments on a large scale that will illustrate all the facts belonging to this science, with the least expense of galvanism, evidently requires some additional modification of the apparatus, and particularly in those cases in which powerful magnets cannot be applied. And such a modification appears to me to be obviously pointed out in the construction of Professor Schweigger's galvanic 'multiplier'; the principles of this instrument being directly applicable to all the experiments in which Mr. Sturgeon's improvement fails to be useful."*

Should any one be disposed to conclude that this simple extension of Schweigger's multiple coil was unimportant and unmeritorious, the ready answer occurs, that talented and skillful electricians, laboring to attain the result, had for six years failed to make such an extension. Nor was the result by any means made antecedently assured by Schweigger's success with the galvanometer. If Sturgeon's improvement of economizing the battery size and consumption, by increasing the magnet factor (in those few cases where available), was well deserving of reward, surely Henry's improvement of a far greater economy, by increasing the circuit factor (entirely neglected by Sturgeon), deserved a still higher applause.

In a subsequent communication to Silliman's Journal, Henry remarks on the results announced in October, 1827: "Shortly after the publication mentioned, several other applications of the coil, besides those described in that paper, were made in order to increase the size of electro-magnetic apparatus, and to diminish the necessary galvanic power. The most interesting of these was its application to a development of magnetism in soft iron, much more extensive than to my knowledge had been

* *Transactions of the Albany Institute*, vol. i, pp. 22, 23.

previously effected by a small galvanic element." And in another later paper, he repeated to the same effect: "After reading an account of the galvanometer of Schweigger, the idea occurred to me that a much nearer approximation to the theory of Ampère could be attained by insulating the conducting-wire itself, instead of the rod to be magnetized; and by covering the whole surface of the iron with a series of coils in close contact."

The electro-magnet figured and described by Sturgeon (in his communication of November, 1825,) consisted of a small bar or stout iron wire bent into a ∩ or horse-shoe form, having a copper wire wound loosely around it in eighteen turns, with the ends of the wire dipping into mercury-cups connected with the respective poles of a battery having 130 square inches of active surface. This was undoubtedly the most efficient electro-magnet then in existence.

In June of 1828, Henry exhibited to the Albany Institute a small-sized electro-magnet closely wound with silk-covered copper wire about one-thirtieth of an inch in diameter. By thus insulating the conducting wire, instead of the magnetic bar or core, he was enabled to employ a compact coil in close juxtaposition from one end of the horse-shoe to the other, obtaining thereby a much larger number of circuits, and with each circuit more nearly at right angles with the magnetic axis. The lifting power of this magnet is not stated, though it must obviously have been much more powerful than the one described by Sturgeon.

In March of 1829, Henry exhibited to the Institute a somewhat larger magnet of the same character. "A round piece of iron about one-quarter of an inch in diameter was bent into the usual form of a horse-shoe, and instead of losely coiling around it a few feet of wire, as is usually described, it was tightly wound with 35 feet of wire covered with silk, so as to form about 400 turns; a pair of small galvanic plates which could be dipped into a tumbler of diluted acid, was soldered to the ends of the wire, and the whole mounted on a stand. With these small plates the horse-shoe became much more powerfully magnetic than another of the same size and wound in the usual manner, by the application of a battery composed of 28 plates of copper and zinc each 8 inches square." In this case the coil was wound upon itself in successive layers.

To Henry, therefore, belongs the exclusive credit of having first constructed the magnetic "spool" or "bobbin," that form of coil since universally employed for every application of electro-magnetism, of induction, or of magneto-electrics.

In the latter part of 1829, Henry still further increased the magnetic power derived from a single galvanic pair of small size, by a new arrangement of the coil. "It consisted in using several strands of wire each covered with silk, instead of one." Employing a horse-shoe formed from a cylindrical bar of iron half an inch in diameter and about ten inches long, wound with 30 feet of tolerably fine copper wire, he found

that with a current from only two and a half square inches of zinc, the magnet held 14 pounds.* Winding upon its arms a second wire of the same length (30 feet) whose ends were similarly joined to the same galvanic pair, the magnet lifted 28 pounds. On these results he remarks:

"These experiments conclusively proved that a great development of magnetism could be effected by a very small galvanic element, and also that the power of the coil was materially increased by multiplying the number of wires, without increasing the length of each. The multiplication of the wires increases the power in two ways: first, by conducting a greater quantity of galvanism, and secondly, by giving it a more proper direction; for since the action of a galvanic current is directly at right angles to the axis of a magnetic needle, by using several shorter wires we can wind one on each inch of the length of the bar to be magnetized, so that the magnetism of each inch will be developed by a separate wire. In this way the action of each particular coil becomes directed very nearly at right angles to the axis of the bar, and consequently the effect is the greatest possible. This principle is of much greater importance when large bars are used. The advantage of a greater conducting power from using several wires might in a less degree be obtained by substituting for them one large wire of equal sectional area; but in this case the obliquity of the spiral would be much greater, and consequently the magnetic action less."†

But in the following year, 1830, Henry pressed forward his researches to still higher results. Assisted by his friend Dr. Philip Ten-Eyck, he proceeded to test the power of electro-magnetic attraction on a larger scale. "A bar of soft iron 2 inches square and 20 inches long was bent into the form of a horseshoe 9½ inches high; (the sharp edges of the bar were first a little rounded by the hammer;) it weighed 21 pounds. A piece of iron from the same bar, weighing 7 pounds, was filed perfectly flat on one surface for an armature or lifter. The extremities of the legs of the horse-shoe were also truly ground to the surface of the armature. Around this horse-shoe 540 feet of copper bell-wire were wound in nine coils of 60 feet each; these coils were not continued around the whole length of the bar, but each strand of wire (according to the principle before mentioned) occupied about two inches and was coiled several times backward and forward over itself. The several ends of the wires were left projecting, and all numbered, so that the first and the last end of each strand might be readily distinguished. In this manner we formed an experimental magnet on a large scale, with which several combinations of wire could be made by merely uniting the different projecting ends. Thus if the second end of the first wire be soldered to the first end of the second wire, and so on through all the series, the whole will form a continued coil of one long wire. By solder-

*It must not be forgotten that at the time when this experimental magnet was made, the strongest electro-magnet in Europe was that of Sturgeon, capable of supporting 9 pounds, with 130 square inches of zinc surface in the battery.

†Silliman's *Am. Journal of Science*, Jan. 1831, vol. xix, p. 402.

ing different ends, the whole may be formed into a double coil of half the length, or into a triple-coil of one-third the length, &c. The horse-shoe was suspended in a strong rectangular wooden-frame 3 feet 9 inches high and 20 inches wide."

Two of the wires (one from each extremity of the legs) being joined together by soldering, so as to form a single circuit of 120 feet, with its extreme ends connected with the battery, produced a lifting-power of 60 pounds. (Experiment 19.) The same two wires being separately connected with the same battery (forming a double circuit of 60 feet each), a lifting-power of 200 pounds was obtained, (Experiment 10,) or more than three times the power of the former case with the same wire. Four wires (two from each extremity of the legs) being separately connected with the battery (forming four circuits) gave a lifting-power of 500 pounds. (Experiment 12.) Six wires (three from each leg) united in three pairs (forming three circuits of 180 feet each) gave a lifting-power of 290 pounds. (Experiment 18.) The same six wires being separately connected with the battery in six independent circuits, produced a lifting-power of 570 pounds, (Experiment 13,) or very nearly double that of the same wires in double-lengths. When all the nine wires were separately attached to the battery a lifting-power of 650 pounds was evoked. (Experiment 14.) In all these experiments "a small single battery was used, consisting of two concentric copper cylinders, with zinc between them; the whole amount of zinc-surface exposed to the acid from both sides of the zinc was two-fifths of a square foot; the battery required only half a pint of dilute acid for its submersion."

"In order to ascertain the effect of a very small galvanic element on this large quantity of iron, a pair of plates *exactly one inch square* was attached to all the wires; the weight lifted was 85 pounds." (Experiment 16.) For the purpose of obtaining the maximum attractive power of this magnet, with its nine independent coils, "a small battery formed with a plate of zinc 12 inches long and 6 wide, and surrounded by copper, was substituted for the galvanic element used in the former experiments: the weight lifted in this case was 750 pounds." (Experiment 15.) *

Although not directly connected with the purpose of this exposition,

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* Silliman's *Am. Jour. Sci.* same vol. pp. 404, 405. The only European physicist who at this period had obtained any magnetic results even *approaching* those effected by Henry, was Dr. Gerard Moll (professor of natural philosophy in the University of Utrecht), who having seen in England in 1828 an electro-magnet of Sturgeon's which supported nine pounds (the very year in which Henry had exhibited a much more powerful magnet before the Albany Institute), "determined to try the effect of a larger galvanic apparatus"; and in 1830 remarked, "I obtained results which appear astonishing." Having formed a horse-shoe about twelve and a half inches in height, of a round bar of iron two and a quarter inches in diameter, he surrounded it with about 26 feet of insulated copper wire one-eighth of an inch thick, in a tolerably close coil of 44 turns. The weight of the whole was about 26 pounds; and with the current from a galvanic pair of about 11 square feet of zinc surface, the magnet sustained a weight of 154 pounds. (Brewster's *Edinburgh Journal of Science*, Oct., 1830, vol. iii, n. s. p. 214.) Henry's magnet less in size and weight, lifted about five times this load, with only one-eleventh of Moll's battery surface.

it may be added here that in the following year, 1831, Henry constructed for the laboratory of Yale College a magnet about one foot high from a three inch octagonal bar of iron thirty inches long, which wrapped with twenty-six strands of copper wire and excited by a battery surface of about five square feet, supported 2,300 pounds. Professor Silliman wrote on this occasion, "He has the honor of having constructed by far the most powerful magnets that have ever been known; and his last, weighing (armature and all) but 82½ pounds, sustains over a ton. It is eight times more powerful than any magnet hitherto known in Europe."* And Sturgeon (if not the real father, at least the true foster-father, of the electro-magnet), with a generous enthusiasm, remarked: "Professor Henry has been enabled to produce a magnetic force which totally eclipses every other in the whole annals of magnetism; and no parallel is to be found since the miraculous suspension of the celebrated oriental impostor in his iron coffin." †

But to return to his investigations of 1830, Henry, after finding that the highest attractive power of the magnet was developed by his novel artifice of multiple coils, proceeded to experiment with the simple spool magnet of long continuous single coil; and his researches were rewarded by a new discovery, namely that though the former method of winding the magnet produced the strongest attraction, the latter arrangement (under special conditions) permitted the weaker attractive power to be exercised at a far greater distance; that is through a much greater length of conducting wire.

Employing his earlier and smaller magnet of 1829, formed of a quarter-inch rod, but wound with about 8 feet of copper wire, he tried the effects of different battery powers, of different length of circuits, and of different lengths of coil upon the magnet. Excited with a single pair, "composed of a piece of zinc plate 4 inches by 7, surrounded with copper" (about 56 square inches of zinc surface), the magnet sustained four and a half pounds. (Experiment 4.) With about 500 feet of insulated copper wire (.045 of an inch in diameter) interposed between the battery and the magnet, its lifting-power was reduced to two ounces; (Experiment 5;) or about 36 times. With double this length of wire (or a little over 1,000 feet) interposed, the lifting-power of the magnet was only half an ounce; (Experiment 4;) thus fully confirming the results obtained by Barlow with the galvanometer; and showing that the same conditions of enfeebled action with increasing length of circuit applied equally to the magnet. With a small galvanic pair 2 inches square, acting through the same length of wire, (over 1,000 feet,) "the magnetism was scarcely observable in the horse-shoe." (Experiment 3.)

Employing next a trough battery of 25 pairs, having the same zinc surface as previously, the magnet in direct connection, (which before had supported four and a half pounds,) now lifted but seven ounces; not

*Silliman's *Am. Jour. Sci.* April, 1831, vol. xx, p. 201.

†*Philosophical Magazine; and Annals*, March, 1832, vol. xi, p. 199.

quite half a pound. But with the 1,060 feet of copper wire (a little more than one fifth of a mile) suspended several times across the large room of the academy, and placed in the galvanic circuit, the same magnet sustained eight ounces: (Experiment 7:) that is to say, the current from the galvanic trough produced greater magnetic effect through this length of wire, than it did without it.

"From this experiment it appears that the current from a galvanic trough is capable of producing greater magnetic effect on soft iron after traversing more than one-fifth of a mile of intervening wire than when it passes only through the wire surrounding the magnet. It is possible that the different states of the trough with respect to dryness may have exerted some influence on this remarkable result; but that the effect of a current from a trough if not increased is but slightly diminished in passing through a long wire is certain." And after speculating on this new and at the time somewhat paradoxical result, Henry concludes: "But be this as it may, the fact that the magnetic action of a current from a *trough* is at least not sensibly diminished by passing through a long wire, is directly applicable to Mr. Barlow's project of forming an electro-magnetic telegraph;* and it is also of material consequence in the construction of the galvanic coil. From these experiments it is evident that in forming the coil we may either use one very long wire, or several shorter ones, as the circumstances may require: in the first case, our galvanic combination must consist of a number of plates so as to give 'projectile' force; in the second, it must be formed of a single pair."†

The importance of this discovery can hardly be overestimated. The magnetic "spool" of fine wire, of a length—tens and even hundreds of times that ever before employed for this purpose,—was in itself a gift to science, which really forms an epoch in the history of electro-magnetism. It is not too much to say that almost every advancement which has been made in this fruitful branch of physics since the time of Sturgeon's happy improvement, from the earliest researches of Faraday downward, have been directly indebted to Henry's magnets.‡ By means of the Henry "spool" the magnet almost at a bound was developed from a feeble childhood to a vigorous manhood. And so rapidly and generally was the new form introduced abroad among experimenters, few of whom had ever seen the papers of Henry, that probably very few indeed have been

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* Really Ampère's project, not Barlow's. In a subsequent paper Henry corrected this allusion by saying, "I called it 'Barlow's project,' when I ought to have stated that Mr. Barlow's investigation merely tended to disprove the possibility of a telegraph."

† Silliman's *Am. Jour. Sci.* Jan. 1831, vol. xix, pp. 403, 404.

‡ Both forms of the Henry magnet have found valuable applications in science. In Faraday's first electrical investigations, in the latter part of 1831, he acknowledged the merit of Henry's magnets, and in constructing his duplex helices for observing the phenomena of induction, he adopted Henry's method of winding 12 coils of copper wire each 27 feet long, one upon the other. (*Philosophical Transactions of the Royal Society*, November 24, 1831, vol. cxxii [for 1832], pp. 126 and 138. And Faraday's *Experimental Researches*, etc. vol. i, art. 6, p. 2, and art. 57, p. 15.)

aware to whom they were really indebted for this familiar and powerful instrumentality. But the historic fact remains, that prior to Henry's experiments in 1829, no one on either hemisphere had ever thought of winding the limbs of an electro-magnet on the principle of the "bobbin," and not till after the publication of Henry's method in January of 1831, was it ever employed by any European physicist.*

But in addition to this large gift to science, Henry (as we have seen) has the pre-eminent claim to popular gratitude of having first practically worked out the differing functions of two entirely different kinds of electro-magnet: the one surrounded with numerous coils of no great length, designated by him the "quantity" magnet, the other surrounded with a continuous coil of very great length, designated by him the "intensity" magnet.† The former and more powerful system, least affected by an "intensity" battery of many pairs, was shown to be most responsive to a single galvanic element: the latter and feebler system, least influenced by a single pair, was shown to be most excited by a battery of numerous elements; but at the same time was shown to have the singular capability (never before suspected nor imagined) of subtile excitation from a distant source. Here for the first time is experimentally established the important principle that there must be a proportion between the aggregate internal resistance of the battery and the whole external resistance of the conjunctive wire or conducting circuit; with the very important practical consequence, that by combining with an "intensity" magnet of a single extended fine coil an "intensity" battery of many small pairs, its electro-motive force enables a very long conductor to be employed without sensible diminution of the effect.‡ This was a very important though unconscious experimental confirmation of the mathematical theory of Ohm, embodied in his formula expressing the relation between electric flow and electric resistance, which though propounded two or three years previously, failed for a long time to attract any attention from the scientific world.§

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* Henry's "spool" magnet appears to have been introduced into France by Pouillet in 1832. See "Supplement," NOTE D.

† "In describing the results of my experiments the terms 'intensity' and 'quantity' magnets were introduced to avoid circumlocution, and were intended to be used merely in a technical sense. By the *intensity* magnet I designated a piece of soft iron so surrounded with wire that its magnetic power could be called into operation by an 'intensity' battery; and by a *quantity* magnet, a piece of iron so surrounded by a number of separate coils that its magnetism could be fully developed by a 'quantity' battery." (*Smithsonian Report* for 1857, p. 103.) These terms though generally discarded by recent writers, are still very convenient designations of the two classes of action, both in the battery and in the magnet.

‡ Beyond a certain maximum length, there is of course a decrease of power for each differing coil of the "intensity" magnet, proportioned to the increased resistance of a long conductor; but the magnetizing effect has not been found to be diminished in the ratio of its length. In a very long wire, the magnetizing influence (with a suitable "intensity" battery) appears to be inversely proportioned to the square of the length of the conductor.

§ Georg Simon Ohm, professor in physics at Munich, published at Berlin, in 1827, his "Galvanische Kette, mathematisch bearbeitet:" and in the following year, he published a supplementary paper entitled "Nachträge zu seiner mathematischen Bearbeitung der galvanischen Kette;" in Kastner's *Archiv für gesammte Naturlehre:*

Never let it be forgotten that he who first exalted the "quantity" magnet of Sturgeon from a power of twenty pounds to a power of twenty hundred pounds, was the absolute CREATOR of the "intensity" magnet; that magnet which alone is able to act at a great distance from its exciting battery;—that magnet which by very reason of its lower "quantity" is alone applicable to the uses of telegraphy.

As Professor Daniell has concisely stated the problem: "Electro-magnets of the greatest power, even when the most energetic batteries are employed, utterly cease to act when they are connected by considerable lengths of wire with the battery."*

Seven years after Henry's first experimental demonstration of this unlooked-for result, and his complete establishment of the conditions required for magnetizing iron at great distances through very long conducting wires, Prof. Charles Wheatstone, of King's College, London, having found a difficulty in signaling through four miles of wire, was enabled to work out the problem for his own telegraph, by help derived from Henry's labors. And yet he permitted his colleague, Prof. John F. Daniell, of King's College, to prefix to the passage above quoted from the excellent treatise on "Chemical Philosophy," the remarkable statement: "Ingenious as Professor Wheatstone's contrivances are, they would have been of no avail for telegraphic purposes without the investigation, *which he was the first to make*, of the laws of electro-magnets, when acted on through great lengths of wire." And this erroneous declaration was published long after Henry's "quantity" and "intensity" magnets had been employed in the experiments of European electricians; and years after Professor Wheatstone himself had formed the acquaintance of Henry, and in April, 1837, had learned from his own lips an account of his elaborate investigations and successful results.†

Whether Baron Schilling ever experimented on a sufficient length of circuit to encounter the fundamental practical difficulty announced by Barlow in 1825 does not appear; but that formidable obstacle to the actual extension of his enterprise, certainly existed until the year 1831, when Henry announced that the principles demonstrated by his researches in 1829 and 1830, were "directly applicable to the project of forming an electro-magnetic telegraph." And while these principles

(8vo. Nürnberg:) 1828, vol. xiv, pp. 475–493. Fourteen years after the publication of the former memoir, this elaborate discussion was for the first time translated into English, by Mr. William Francis. ("The Galvanic Circuit investigated mathematically." Taylor's *Scientific Memoirs*, etc. London, 1841, vol. ii, pp. 401–506.)

* *Introduction to the Study of Chemical Philosophy*, second edition, 8vo. London, 1843, chap. xvi, sect. 859, p. 576.

† *Smithsonian Report* for 1857, pp. 111, 112. The following pertinent extract is made from an excellent and appreciative memoir of the "Life and Work of Joseph Henry," recently read at the annual session of the American Electrical Society, at Chicago, Ill., December 12, 1878, by one of its vice-presidents, Mr. Frank L. Pope: "In 1856, referring again to these experiments, Wheatstone writes: 'With this law and its applications, *no persons in England*, who had before occupied themselves with experiments relating to electric telegraphs, had been acquainted.' . . . It would seem from the peculiar wording of Wheatstone's statement last quoted, that he must then have been aware of Henry's priority in this respect, and had his experiments in mind, at the time of writing it." (*Journal of the Am. Electrical Society*, vol. ii, pp. 135, 136.) This subject is more fully considered in the "Supplement," NOTE F.

underlie all subsequent applications of the intermittent magnet, they form indeed the indispensable basis of every form of the electro-magnetic telegraph since invented. They settled satisfactorily (in Barlow's phrase) the "only question which could render the result doubtful"; and though derived from the magnet, were obviously as applicable to the galvanometer needle.*

It is idle to say in disparagement of these successes, that in the competitive race of numerous distinguished investigators in the field, diligently searching into the conditions of the new-found agency, the same results would sooner or later have been reached by others. For of what discovery or invention may not the same be said? Only those who have sought in the twilight of uncertainty, can appreciate the vast economy of effort by prompt directions to the path from one who has gained an advance. Not for what might be, but for the actual bestowal, does he who first grasps a valuable truth merit the return of at least a grateful recognition.

1831. As an experimental demonstration of the telegraph—now made possible, Joseph Henry, early in the year 1831, suspended around the walls of one of the upper rooms in the Albany Academy, a mile of copper bell-wire interposed in a circuit between a small Cruickshanks battery and an "intensity" magnet. A narrow steel rod (a permanent magnet) pivoted to swing horizontally like the compass needle, was arranged so that one end remained in contact with a limb of the soft iron core, while near the opposite end of the compass rod a small stationary office-bell was placed. At each excitation of the electro-magnet, the compass rod or needle was repelled from one limb (by its similar magnetism) and attracted by the other limb, so that its free end tapped the bell. On reversing the current, the compass rod moved back to the opposite limb of the electro-magnet. This simple device the Professor was accustomed to exhibit to his classes at the academy, during the years 1831 and 1832, in illustration of the facility of transmitting signals to a distance by the prompt action of electro-magnetism.†

This memorable experimental telegraphic arrangement involved three very significant and important novelties. In the first place, it was the first electro-magnetic telegraph employing an "intensity" magnet ca-

* When urged by a zealous friend to secure an early patent on these valuable and pregnant improvements, Henry resolutely withstood every importunity, seeming to feel that a discoverer's position and aptitude are lowered by courting self-aggrandizement from scientific truth; a self-denying generosity which characterized him throughout his life. While such disinterestedness cannot fail to excite our admiration, it may perhaps be questioned whether in this case it did not, from a practical point of view, amount to an over-fastidiousness; whether such legal establishment of ownership, shielding the possessor from the occasional depreciations of the envious, and securing by its more tangible remunerations the leisure and the means for more extended researches, would not have been to science more than a compensation for the supposed sacrifice of dignity by the philosopher. Since the date of the American patents of Wheatstone and of Morse (ten years later) several hundred patents have been granted in this country for ingenious improvements upon or modifications of the electro-magnetic telegraph, all of them necessarily dependent on Henry's original invention.

† For the testimonials of a few surviving eye-witnesses to the practical working of Henry's experimental line in 1831, and 1832, see "Supplement," NOTE E.

pable of being excited at very great distances from a suitable "intensity" battery. And there can be no doubt that a similar combination of "intensity" battery, with a very long coil galvanometer (such as had previously been found inoperative), was alone wanting to have rendered the early telegraph of Schilling a popular and commercial success.

In the second place, this experimental arrangement of Henry was the first electro-magnetic telegraph employing the armature as the signaling device; or employing the *attractive* power of the intermittent magnet, as distinguished from the *directive* action of the galvanic circuit. That is to say, it was strictly speaking the first "*magnetic* telegraph."

In the third place, it was the first *acoustic* electro-magnetic telegraph. One practical inconvenience of the "needle" system has been found to be the perfect silence of its indications; and hence in almost every case a call-alarm has been required to insure attention to its messages. In this respect the intermittent magnet presents the advantage, not merely of a greater mechanical power from the same galvanic current, and thus of a better adaptation for striking a bell at a distance, but of being in itself an audible sounder by the mere impacts of its armature.*

It is suggestive to consider for a moment how different would have been the popular estimate of Henry's labors, (and especially the *practical* estimation of subsequent patentees), if the modest discoverer and inventor had been "worldly-wise" enough to secure an early patent on these three indisputably original and most pregnant features of telegraphy:—to contest which no rival has ever appeared.†

In 1832, Henry was elected to the chair of natural philosophy in the college of New Jersey, at Princeton. In 1834, he constructed for the laboratory of this college an original and ingenious form of galvanic battery, comprising eighty-eight elements, (each having an active zinc surface of one and a half square feet,) of which any number, from a single pair upward, could be brought into action; while by means of adjustable

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* It may be incidentally mentioned that early in 1831, after the satisfactory operation of the first telegraphic magnet, Henry contrived the first Electro-magnetic Engine, comprising an oscillating horizontal electro-magnetic bar, just below each end of which was secured an upright permanent magnet, the two having similar poles. The polarity of the oscillating electro-magnet was reversed at the moment of attractive contact, by automatically inverting the circuit current, and thus each of its poles was alternately attracted and repelled by its neighboring magnet. (Silliman's *Am. Journal of Science*, July, 1831, vol. xx, pp. 340–343.) Henry was therefore the original inventor of the automatic pole-changer or commutator,—a device having a very wide range of useful application. The illustrious English physicist, James P. Joule, in his "Historical Sketch of the rise and progress of Electro-magnetic Engines for propelling machinery," remarks: "The improved plan by Professor Henry of raising the magnetic action of soft iron, developed new and inexhaustible sources of force which appeared easily and extensively available as a mechanical agent; and it is to the ingenious American philosopher, that we are indebted for the first form of a working model of an engine upon the principle of reciprocating polarity of soft iron by electro-dynamic agency." (Sturgeon's *Annals of Electricity*, etc. March, 1839, vol. iii, p. 430.)

† A quarter of a century afterward Henry could proudly say, "I have sought no patent for inventions, and solicited no remuneration for my labors, but have freely given their results to the world; expecting only in return to enjoy the consciousness of having added by my investigations to the sum of human knowledge, and to receive the credit to which they might justly entitle me." (*Smithsonian Report* for 1857, p. 86.)

conductors, all the positive elements could be associated together, as also all the negative ones, so as to form virtually a single pair having 132 square feet of zinc surface, or any smaller area desired. In this manner the apparatus could readily be transformed into a "quantity" battery, or an "intensity" battery, at pleasure. In the same year he constructed for the laboratory a powerful "quantity" magnet, surpassing his Yale College magnet; its lifting power, with a battery not exceeding one cubic foot in bulk, being 3,500 pounds. In the following year, 1835, he extended wires across the front campus of the college grounds, from the upper story of the library building to the philosophical hall on the opposite side, through which magnetic signals were occasionally sent, distinguished by the number of taps on the bell, as first exhibited by him four or five years earlier in the hall of the Albany Academy. Although Henry had established the fact (contrary to all the antecedent expectation of physicists) that the most powerful form of magnet—the "quantity" magnet—is not the form best adapted to distant action through an extended circuit, the ingenious idea occurred to him that he could easily combine such a system with the feebler "intensity" system, so as to produce powerful mechanical action at almost any required distance. It was simply necessary to apply to the oscillating armature of the distant "intensity" magnet a suitable prolongation so arranged as to open and close the short circuit of the adjoining "quantity" magnet of any available power. It was with his Princeton telegraph line, and its comparatively feeble magnet, that he undertook the experiment of breaking by the mere lift of a small wire from a mercury thimble the "quantity" circuit of his monster magnet, and thus causing its heavy load to fall:—a force scarcely safe if exerted through any sensible distance. He thus fully illustrated the practicability of calling into action at a great distance a power capable of producing the most energetic mechanical effects.*

1833. Ten years after the experimental telegraph of Schilling, Professors Carl Friedrich Gauss and Wilhelm Edward Weber constructed at Göttingen a galvanometer telegraph of single circuit from the Cabinet of Natural Philosophy to the Observatory, a distance of about a mile and a half. The two naked wires after the method of Weber were carried over the houses and steeples of Göttingen, being supported by insulators. The battery power being small, the receiving apparatus consisted of a "multiplier" containing a very great length of fine silvered copper wire; and the magnetic bar suspended by a silk thread carried on the axis of suspension a small mirror, whose minute deflections were observed at the distance of ten or twelve feet through a telescope.† The tele-

Smithsonian Report for 1857, pp. 106, 112.

† This appears to be one of the first employments of a reflecting galvanometer, an instrument which in the hands of Sir William Thomson has been brought to an extreme degree of sensibility, and has rendered ocean telegraphy possible. As early as 1826, however, Prof. Christian J. Poggendorff applied the reflector to the magnetic needle for accurately determining minute variations in its horizontal declination. (Pogg. *Annalen der Phys. und Chem.* 1826, vol. vii. pp. 121–130.)

graph was first worked by a galvanic current from a battery, and afterward for convenience by the secondary current from a magneto-electric apparatus; to which Gauss adapted an arrangement of commutator, whereby the direction of the induced current could be instantly reversed by a touch of the finger. The alphabet of signs was made up of differing combinations of right and left deflections of the needle. Weber applied to the signaling device a delicate apparatus for setting off a clock alarm.*

1836. Prof. C. A. Steinheil, of Munich, at the request of Gauss, (who was absorbed in more abstract researches on magnetism,) in 1834, undertook to develop and improve his arrangement; and in 1836 had constructed a similar galvanometer telegraph line between Munich and Bogenhausen, a distance of about two miles. † Employing a greater power he arranged at the receiving station the magnetic bar or double bars of the galvanometer with a larger sweep, so that two bells of differing tones should be struck thereby; and he thus produced an acoustic telegraph (five years later than Henry's), capable of audible language, and dispensing with the occasion for any call-alarm. To the adjacent ends of the two magnetic bars having opposite polarities, but oscillating within the same coil, he applied fountain pens or marking-points so as to make permanent alternating dots on a fillet of paper carried under them by the regular movement of clock-work, in the manner long familiarly employed in self-registering meteorological and other instruments. Although Dyar, on Long Island, had devised a chemical register as early as 1828, and had partly executed it by a successful trial, this double magnet of Steinheil appears to constitute the earliest operative application of an automatic record to the electric, or to the electro-magnetic, telegraph. Steinheil also improved somewhat on the alphabet of Gauss, though adopting substantially the same system.‡

In the following year, 1837, he made another most important improvement in practical telegraphy, by the unexpected discovery that even the single circuit of a to and fro line could be further simplified by the suppression and economy of one-half of its wire.§

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* *Göttingische Gelehrte Anzeigen*, Aug. 9, 1834, part ii, No. 128, pp. 1272, 1273. And *Polytechnisches Central-Blatt*, June, 1838, Jahrgang iv, No. 31, pp. 487–496.

† According to Dr. Hamel of St. Petersburg, in the early part of July, 1837, "Steinheil, at Munich, had completed the connection of his house in the Lerchenstrasse with the building of the Academy of Sciences, and with the Royal Observatory at Bogenhausen, by means of 36,000 feet of wire for conducting the current both ways, the wires being suspended in the air." (*Journal of Society of Arts*, July 29, 1859, vol. vii, p. 609.)

‡ Steinheil remarks: "As long as the intervals between the separate signs remain equal, they are to be taken together as a connected group, whether they be pauses between the tones, or intervals between the dots marked down. A longer pause separates these groups distinctly from each other. We are thus enable l, by appropriately selected groups thus combined, to form systems representing the letters of the alphabet, or stenographic characters, and thereby to repeat and render permanent at all parts of the chain where an apparatus like that above described is inserted, any information that we transmit. The alphabet that I have chosen represents the letters that occur the oftenest in German by the simplest signs." (Sturgeon's *Annals of Electricity*, etc. April, 1839, vol. iii, p. 520.)

§ "In 1837 Professor Steinheil operated a telegraph line between Munich and Bogen-

"Quite recently I made the discovery that the ground may be employed as one-half of the connecting chain. As in the case of frictional electricity, water or the ground may with the galvanic current form a portion of the connecting wire. Owing to the low conducting power of these bodies compared with metals, it is necessary that at the two places where the metal conductor is in connection with the semi-conductor, the former should present very large surfaces of contact. Taking water for instance to conduct two million times worse than copper, a surface of water proportional to this must be brought in contact with the copper, to enable the galvanic current to meet with equal resistance in equal distances of water and of metal; for instance, if the section of a copper wire is one-half of a square line, it will require a copper plate of 61 square feet of surface in order to conduct the galvanic current through the ground as the wire in question would conduct it: but as the thickness of the metal is quite immaterial in this case, it will be always within our reach to get the requisite surfaces of contact at no great expense. Not only do we by this means save half the conducting wire, but we can even reduce the resistance of the ground below what that of the wire would be, as has been fully established by experiments made here with the experimental telegraph."*

In his account of these valuable contributions to both the science and the art of electric telegraphy, Steinheil modestly assigns to his immediate predecessors the credit of the most important advancements in the system. He says: "To Gauss and Weber is due the merit of having, in 1833, actually constructed the first simplified galvano-magnetic telegraph. It was Gauss who first employed the excitement of induction [magneto-electricity], and who demonstated that the appropriate combination of a limited number of signs is all that is required for the transmission of communication.† Weber's discovery that a copper wire 7,460 feet long, which he had led across the houses and steeples at Göttingen, from the Observatory to the Cabinet of Natural Philosophy, required no special insulation, was one of great importance. The principle was thereby at once established of bringing the galvanic telegraph to the most convenient form. In accordance with the principles we have laid down, all that was required in addition to this was to render the signals audible; a task that apparently presented no very particular difficulty, inasmuch as in the very scheme itself a mechanical motion—namely the deflection of a

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hausen, in Germany, using iron wire conductors, and the earth for a return circuit. This discovery was published in 1837, in German, and translated into English by Julian Guggsworth, November 24, 1838." (Prescott's *Hist. Electr. Telegraph*, 1860, chap. xxi, p. 405.) An account of Steinheil's telegraph was read before the French Academy of Sciences, September 10, 1838. (*Comptes Rendus*, vol. vii, pp. 590–593.)

*Steinheil's paper "On Telegraphic Communication:" translated from the German, November 24, 1838, by Julian Guggsworth. Sturgeon's *Annals of Electricity*, etc. April, 1839, vol. iii, p. 512. A full description of Steinheil's telegraph is given in Dr. Julius Dub's *Anwendung des Elektromagnetismus*, Berlin, 1863; 2d edition, 1873, sect. v, pp. 339–347.

†These statements do not however do justice to Schilling's much earlier "simplified galvano-magnetic telegraph," with which Steinheil was very imperfectly acquainted.

magnetic bar—was given. All that we had to do therefore was to contrive that this motion should be made available for striking bells or for marking indelible dots. This falls within the province of mechanics, and there are therefore more ways than one of solving the problem. Hence the alterations that I have made in the telegraph of Gauss, and by which it has assumed its present form, may be said to be founded on my perception and improvement of its imperfections, in harmony with what I had previously laid down as necessary for perfect telegraphic communication. I by no means however look on the arrangement I have selected as complete; but as it answers the purpose I had in view, it may be well to abide by it till some simpler arrangement is contrived."* To Steinheil's lasting honor be it said, that when some dozen years later "a simpler arrangement" of the receiving instrument *was* brought to his attention, he was the first to appreciate it and to urge upon the Bavarian Government its adoption, to the abandonment of a portion of his own beautiful system. An example of magnanimity, or more properly of intellectual and unbiased judgment, much rarer with inventors of practical improvements in art, than with discoverers of truth in science.

These later developments of the telegraph, though in public use at the dates specified, not having been generally described by their authors immediately for publication, were from the meager notices of them found in the foreign journals, but little known in this country for several years afterward; and hence naturally arose the strong patriotic impression with many that the electro-magnetic telegraph was essentially an American invention.

About the same time that Steinheil in Munich was engaged in improving the needle telegraph, a distinguished chemical philosopher of London, was developing the galvanic battery; and he succeeded in giving that important apparatus a uniformity and continuity of action previously unhoped for. In the adopted forms of the Voltaic battery as arranged by Cruickshanks and others, the oxygen liberated by the active zinc surface rapidly attacked the plate, forming a coating of oxide over it which soon greatly impaired its chemical and galvanic efficiency. On the other hand, the hydrogen liberated at the surface of the copper, remained largely adherent to it in the form of minute bubbles, thus insulating it to a corresponding extent from contact with the liquid; while at the same time dissolved zinc was deposited on its exposed surface.

To obviate these impediments, Professor John Frederic Daniell provided a porous partition between the two metals, which while permitting the necessary conductibility from one side to the other, prevented the convective intermixture of the separated portions of liquid, and thus also allowed for the first time two different liquids to be employed for bathing the different metals. The liquid employed on the copper side

* Sturgeon's *Annals of Electricity*, etc. Mar. 1839, vol. iii, pp. 448, 449.

was a saturated solution of the sulphate of copper;—crystals of the sulphate being suspended in the liquid, for supplying the exhaustion of the copper. The liquid on the zinc side was a very diluted sulphuric acid. With this arrangement the oxygen evolved at the zinc surface forms mainly a zinc oxide, which dissolved by the liquid into a sulphate of zinc, is prevented from passing to the copper side of the partition, and the hydrogen evolved at the copper surface combining at once with the oxygen of the copper salt, forms water, and allows the free copper to be deposited on its own plates: and Professor Daniell was able to announce in a paper read before the Royal Society of London, February 11, 1836, "I have been led to the construction of a voltaic arrangement which furnishes a constant current of electricity for any length of time which may be required."*

Although it is true that the electric telegraph may be operated by the old form of battery—frequently renewed, (just as a good steam-engine may be efficiently worked by an inferior and wasteful boiler,) and also that a uniform current well adapted to the telegraph may be obtained from the magneto-electric machine, yet the "constant" battery has proved a most valuable boon in promoting the practical economy and success of modern telegraphy.

1837. Mr. William Fothergill Cooke and Prof. Charles Wheatstone obtained an English patent June 12, 1837, (No. 7390,) for a galvanometer or needle telegraph, very similar to the earlier one of Schilling, employing six wires and five indicating needles. At what date Prof. Wheatstone's attention was first directed to electrical signaling cannot now be ascertained; but in 1834 he had undertaken by means of his ingenious invention of the revolving mirror (capable of measuring the millionth of a second), to determine the velocity of ordinary electricity through half a mile of copper wire;† and a year or two later, through about four miles of the same. Early in 1836, he had contemplated a telegraph which with five needles, should give thirty signs. Mr. W. F. Cooke, attending a lecture on electro-magnetic communication by Professor Muncke, at Heidelberg, March 6, 1836, (as previously mentioned,) at which the telegraphic apparatus of Schilling was exhibited, at once "conceived the idea." In his "Statement of facts to the Arbitrators" in December, 1840, Mr. Cooke declares: "Mr. Möncke's experiment was at that time the only one upon the subject that I had seen or heard of. It showed that electric currents being conveyed by wires to a distance, could be there caused to

* *Phil. Trans. Roy. Soc.* 1836, vol. cxxvi, p. 107. In the "gravity battery" of Callaud, and of Varley, the porous diaphragm is dispensed with by placing the lighter liquid (a diluted solution of zinc sulphate) above the heavier liquid (a saturated solution of copper sulphate); the separation being maintained by their difference of specific gravity. In this arrangement the copper plate rests at the bottom of the cell, and the zinc plate is supported at its top.

† *Philosoph. Transac. of Roy. Soc.* (read June 19, 1834), vol. cxxiv, pp. 583–589. In this paper, Wheatstone says, that his first ineffectual attempt to discover a velocity of electricity was made in 1830. "The method by which I then proposed to effect this purpose, was announced in a lecture delivered by Dr. Faraday, at the Royal Institution, in June, 1830." (p. 583.)

deflect magnetic needles, and thereby to give signals. It was in a word a hint at the application of electricity to telegraphic purposes; but nothing more, for it provided no means of applying that power to practical uses. [!] . . . Within three weeks after the day on which I saw the experiment, I had made (partly at Heidelberg and partly at Frankfort) my first electric telegraph of the galvanometer form."* This apparatus comprised three indicating needles in connection with three circuits of six wires; each terminus of the line being provided with both transmitting keys, and indicating galvanometers. Mr. Cooke also applied a call-alarm, differing from Schilling's in having an ordinary clock-alarm, (similar to that used by Weber several years previously,) checked by an armature detent which was released on the excitement of an electro-magnet by the current. Not being skilled in electrical science however, nor aware of Henry's researches, he soon found the difficulty of operating with a "quantity" battery his galvanometer coils through a long circuit; and in February, 1837, he was introduced to Professor Wheatstone by Dr. P. M. Roget.† On comparing their respective projects of a needle telegraph, the two concluded to combine their exertions in a partnership; and in a little more than three months they secured a joint patent on their perfected system.‡ An experimental line between Euston Square and Camden Town Stations (a distance of a mile and a quarter), was worked with partial success July 25, 1837; and early in 1838, the patentees established a telegraph line between Paddington and West Dayton; the distance between these two points being about thirteen miles. Neither of these "co-inventors" appears at this time to have been aware of the early needle telegraph of Baron Schilling, whose arrangement had been so closely imitated by Mr. Cooke, and whose later simplification and improvement he had failed to reach.

As illustrative of the mistaken and inaccurate manner in which important accounts are often transmitted by even intelligent and honest men,—without due investigation and information, a quotation may here be made from the "Award" of arbitration between the subsequent conflicting claims of Cooke and of Wheatstone, rendered 27th April, 1841, by the referees, Marc Isambord Brunel, the eminent engineer, and John Frederick Daniell, the eminent chemist, meteorologist, and electrician. They state: "In March, 1836, Mr. Cooke, while engaged in scientific pursuits [!], witnessed for the first time one of those well-known experiments on electricity [!] considered as a possible means of communicating intelligence [!], which have been tried and exhibited from time to time [!] during many years by various philosophers!"§ And thus, in strange

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* *The Electric Telegraph*, etc. by William Fothergill Cooke, 2 parts, 8vo. London, 1856, 1857; part ii, "Arbitration Papers," sects. 14, 18, pp. 14, 15.

† For an account of the circumstances attending and following this conference, see "Supplement," NOTE F.

‡ Messrs. Cooke & Wheatstone's English patent is dated June 12, 1837, No. 7390; and their American patent, June 10, 1840, No. 1622.

§ *The Electric Telegraph*, etc. by William Fothergill Cooke, 2 parts, 8vo., London, 1856, 1857; part i, p. 14: and part ii, p. 211; also p. 265.

exaggeration of Cooke's contribution to telegraphy, not only is Schilling's fine invention (of which the arbitrators had probably never heard) entirely overlooked, but even Professor Muncke's intelligent exposition of it, (by Mr. Cooke's representation—a "well-known experiment,") is dismissed as the recurrent exhibition "by various philosophers,"—probably as familiar in London as in Heidelberg.*

1837. About the date of the Cooke and Wheatstone patent (or a month or two later in the same year), a different form of electro-magnetic telegraph was being slowly developed in the city of New York. In the autumn of the year 1835, an American artist of acknowledged merit and of liberal education, a graduate of Yale College, about forty-five years of age, was appointed professor of the arts of design in the University of the city of New York, then recently established.† Occupying rooms in the unfinished building, he commenced experimenting on an electro-magnetic recording telegraph, the idea of which had for several years been floating in his mind. An upright square frame secured to the edge of a table, was provided with a transverse strip or shelf about midway of its height, on which was arranged a small Sturgeon electro-magnet lying upon its side, with its poles directed outward from the side of the frame. Directly in front of this, a wooden pendulum suspended from the top bar of the frame and having at its middle a small iron bar acting as an armature for the magnet, was allowed a small play to and from the lower part of the frame. To the lower end of the pendulum was attached a pencil projecting downward, and made adjustable so as to bear lightly against a strip of paper supported by a roller beneath, and slowly moved along near the edge of the table by clock-work, after the manner usually employed in recording apparatus. A single cup formed the galvanic element, and the circuit involving the electro-magnet was closed and opened by means of a lever armed with a wire fork which dipped into two mercury thimbles connected respectively

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* Two other projects of needle telegraph on Ampère's and Schilling's plan, belonging to the latter part of 1837, require here only a passing notice. The first, that of a Mr. Alexander, exhibited at the Society of Arts in Edinburgh, comprised thirty transmitting keys with pins beneath, which on being depressed, closed the circuit by dipping into a transverse mercury trough, and thirty galvanometer needles at the receiving station, each carrying a light paper screen, which just covered a painted letter or mark when at rest, but which by deflection, exposed the desired letter to view. By ingeniously employing but a single wire for the return path of each circuit, the inventor required but thirty-one wires. (*Mechanics' Magazine*, London, Nov. 25, 1837, No. 746, vol. xxviii, pp. 122, 123.) The second scheme, very similar to the preceding, that of a Mr. Davy, exhibited at Exeter Hall, in London, employed but eight transmitting keys, each commanding three letters by different movements, and at the receiving desk twenty-four letters on ground glass, illuminated by a lamp, each of which became visible only on the removal of a screen on the needle, placed behind the glass. An observer remarked that in the desk "there is an aperture about 16 inches long and 3 or 4 inches wide, facing the eyes, perfectly dark. On this the signals appear as luminous letters, or combinations of letters, with a neatness and rapidity almost magical." (*Mech. Mag.* Feb. 3, 1838, No. 756, vol. xxviii, pp. 295, 296.)

† This is a different institution from the University of New York State, which has mainly a supervisory function.

with the two poles of the cup battery. A series of types having on their upper face teeth or cogs varying in number, were set up as desired in the groove of a rule or composing-stick, which was caused to pass under the free end of the circuit lever; and in this way the oscillation of the said lever over the projecting teeth determined the intervals of transmission of the magnetizing current according to the combinations previously arranged in the composing-stick. The movement of the strip of paper beneath the pencil of the pendulum produced a continuous straight line so long as the pendulum remained at rest; but at each momentary attraction of its armature by the magnet, (induced by the completion of the galvanic circuit on the passage of a tooth under the circuit lever,) the play of the pendulum caused a lateral deviation of its pencil, which thus produced a transverse V-shaped interruption of the straight line.

With this arrangement of apparatus the projector was enabled to produce signals through short circuits of wire: but he soon discovered to his dismay that on interposing more than a few yards of insulated wire, the oracle was dumb. Although the remedy for this defect (first discovered and demonstrated by Henry) had been for four or five years familiar to the students of science, the reading of the artist had not been in the direction of scientific literature; and he had conducted his experiments with a surprising indifference and inattention to the existing state of knowledge upon the subject. In this emergency he wisely procured the scientific assistance of a colleague, Dr. Leonard D. Gale, professor of chemistry in the same university, and the material and mechanical assistance of Mr. Alfred Vail, of the Speedwell Iron Works near Morristown, N. J.

The following is the account given by Dr. Gale of the early condition of this experimental telegraph, and of his own connection therewith:

"In the winter of 1836–'37, Samuel F. B. Morse, who as well as myself was a professor in the New York University, city of New York, came to my lecture-room, and said he had a machine in his lecture-room or studio which he wished to show me. I accompanied him to his room, and there saw resting on a table a single-pair galvanic battery, an electro-magnet, an arrangement of pencil, a paper-covered roller, pinion-wheels, levers, &c., for making letters and figures to be used for sending and receiving words and sentences through long distances. . . . At this time as Morse assured me no man had seen the machine except his brother, Sidney E. Morse. . . . Morse's machine was complete in all its parts, and operated perfectly through a circuit of some forty feet, but there was not sufficient force to send messages to a distance. At this time I was a lecturer on chemistry, and from necessity was acquainted with all kinds of galvanic batteries; and knew that a battery of one or a few cups generates a large quantity of electricity, capable of producing heat, &c., but not of projecting electricity to a great distance; and that to accomplish this a battery of many cups is

necessary. It was therefore evident to me that the one large cup-battery of Morse should be made into ten or fifteen smaller ones to make it a battery of intensity, so as to project the electric fluid. . . . Accordingly I substituted the battery of many cups for the battery of one cup. The remaining defect in the Morse machine, as first seen by me, was that the coil of wire around the poles of the electro-magnet consisted of but a few turns only, while, to give the greatest projectile power, the number of turns should be increased from tens to hundreds, as shown by Professor Henry, in his paper published in the *American Journal of Science*, 1831. . . . After substituting the battery of twenty cups for that of a single cup, we added some hundred or more turns to the coil of wire around the poles of the magnet, and sent a message through 200 feet of conductors; then through 1,000 feet; and then through ten miles of wire arranged on reels in my own lecture-room in the New York University, in the presence of friends. All these experiments were repeated with the original Morse machine, modified as I have stated, by increasing the number of battery-cups and the number of turns of wire around the magnet."*

The following account by the author himself, of his first experiments, is taken from his own deposition in the "Bain" case, in February, 1851: "In the year 1835, I was appointed a professor in the New York City University, and about the month of November of that year I occupied rooms in the university buildings. There I immediately commenced with very limited means to experiment upon my invention. My first instrument was made up of an old picture or canvas frame fastened to a table, the wheels of an old wooden clock moved by a weight to carry the paper forward, three wooden drums, upon one of which the paper was wound and passed over the other two, a wooden pendulum suspended to the top piece of the picture or stretching frame and vibrating across the paper as it passed over the center wooden drum, a pencil at the lower end of the pendulum in contact with the paper, an electro-magnet fastened to a shelf across the picture or stretching frame opposite to an armature made fast to the pendulum, a type-rule and type, for closing and breaking the circuit, resting on an endless band (composed of carpet-binding), which passed over two wooden rollers moved by a wooden crank and carried forward by points projecting from the bottom of the rule downward into the carpet-binding, a lever with a small weight on

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* *Memorial of S. F. B. Morse*, 8vo. Washington, 1875, pp. 15–17. The practical improvements introduced by Professor Gale into the arrangement devised by Professor Morse appeared to the latter so obviously mere matters of degree that he felt confident (after they were shown) that he would himself have effected them by simple trial or experimentation; and he does not appear ever to have realized that any scientific principle was involved in the difference. But had he increased separately either the number of his galvanic elements or the number of coils upon his magnet, he would equally have failed to accomplish the desired result. The chance that he would have *combined* these increments may be estimated as very low indeed, when we consider that much wiser and more scientific heads had failed entirely to attain such purpose and arrangement.

the upper side and a tooth projecting downward at one end operated on by the type, and a metallic fork, also projecting downward over two mercury cups, and a short circuit of wire embracing the helices of the electro-magnet, connected with the positive and negative poles of the battery, and terminating in the mercury cups. . . . Early in 1836, I procured forty feet of wire, and, putting it in the circuit, I found that my battery of one cup was not sufficient to work my instrument.* . . . A practical mode of communicating the impulse of one circuit to another, such as that described in my patent of 1840, was matured as early as the spring of 1837, and exhibited then to Professor Gale, my confidential friend. Up to the autumn of 1837 my telegraphic apparatus existed in so rude a form that I felt reluctance to have it seen."†

In substantial accord with Professor Morse's deposition is that of his colleague and assistant, Professor Gale, taken in a previous case, and dated April 1, 1848, in which it is added that "On Saturday, the 2nd day of September, 1837, Professor Daubeny, of the English Oxford University, being on a visit to this country, was invited with a few friends to see the operation of the telegraph in its then rude form in the cabinet of the New York City University, where it then had been put up with a circuit of 1,700 feet of copper wire stretched back and forth in that long room. This exhibition of the telegraph, although of very rude and imperfectly constructed machinery, demonstrated to all present the practicability of the invention; and it resulted in enlisting the means, the skill, and the zeal of Mr. Alfred Vail."‡

The record made on the trial exhibited September 2d, appears not to have been entirely satisfactory, for on the following Monday (September 4th) a still better performance was effected, as announced by a letter of that date addressed by Professor Morse to the editor of the New York "Journal of Commerce," in which the writer says: "I have the gratification of sending you a specimen of the writing of my telegraph, the actual transmission of a communication made this morning, in a more complete manner than on Saturday, and through the distance of one-third of a mile." This specimen of telegraphic communication, with its accompanying letter, was re-produced in the "Journal of Commerce" three days

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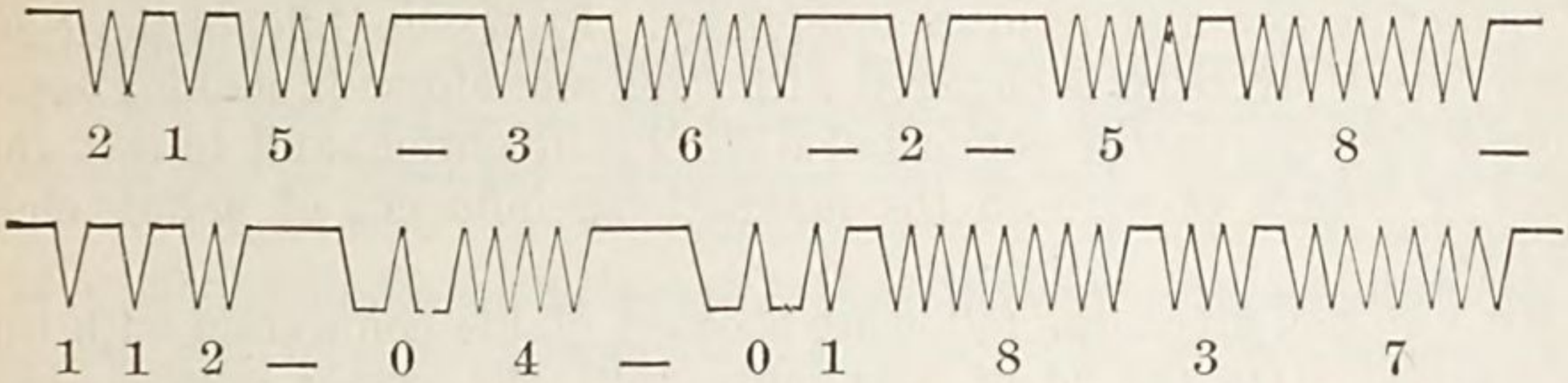
* [Had Professor Morse tried 50 or 100 cups, he would have found them equally insufficient: a fact here quite ignored.]

† *Deposition of Samuel F. B. Morse:* Feb. 6, 7, and 8, 1851. In the case of "B. B. French and others *vs.* H. J. Rogers and others." Circuit court of U. S. for E. Dist. of Pa. April session 1850. No. 104. "Complainant's Evidence." Ninth answer, pp. 167–169.

‡ *Modern Telegraphy:* a pamphlet by Professor Morse, Paris, 1867, Appendix, p. 19. This first experimental exhibition, it must be remembered, was nearly three months after the date of Cooke and Wheatstone's patent, more than a month after their successful operation through a mile and a quarter, and while the English inventors were engaged in constructing a working line from Paddington to West Dayton. Mr. A. Vail, a young man of fine abilities, was a pupil of Dr. Gale's, and was by him introduced to Professor Morse.

later, and forms the earliest publication of the actual operation of the "Morse telegraph."* The dispatch is as follows:



This cipher is thus explained by the writer, reference being had to a dictionary suitably prepared with numbered words. "To illustrate by the diagram, the word 'successful' is first found in the dictionary, and its telegraphic number, '215,' is set up in a species of type prepared for the purpose; and so of the other words. The type then operate upon the machinery and serve to regulate the times and intervals of the passage of electricity. Each passage of the fluid causes a pencil at the extremity of the wire to mark the points as in the diagram. To read the marks, count the points at the bottom of each line. It will be perceived that two points come first, separated by a short interval from the next point. Set '2' beneath it. Then comes one point, likewise separated by a short interval. Set '1' beneath it. Then come five points. Set '5' beneath them. But the next interval in this case is a *long* interval; consequently the three numbers comprise the whole number '215.' So proceed with the rest until the numbers are all set down. Then by referring to the telegraphic dictionary, the words corresponding to the numbers are found, and the communication read. Thus it will be seen that by means of the changes upon ten characters, all words can be transmitted."†

In the above line or diagram representing the telegraphic dispatch, the symbol "Λ" (or inverted V), which occurs twice in the lower line, represents a cipher or zero; and this character, when preceding a figure or group of figures, indicates that the figure or group is to be read as an actual number, and not as the index of a word. Counting thus the number of V points in the above dispatch forming groups separated by a line (—), we obtain the following numbers: "215—36—2—58—112—04—01837." And this message when translated by help of the numbered dictionary will read "Successful experiment with telegraph September 4 1837."

An account of this success, published in Silliman's Journal for October, added the statement: "Since the 4th of September, one thousand feet more of wire No. 23 have been added, making in all two thousand

*Notwithstanding the very crude condition of this invention in September, 1837, as compared with that of Schilling in 1830 (or probably in 1823), and that of Gauss in 1833, the fact that intelligible signals were actually exhibited by it at this date, fully justifies the acceptance of this period as the time of its reduction to practical operation.

†New York *Journal of Commerce*, Thursday, September 7, 1837: (on the editorial page.)

seven hundred feet, more than half a mile of a reduced size of wire. The register still recorded accurately. Arrangements have been made for constructing new and accurate machinery. Professor Gale, of the New York City University, is engaged with Professor Morse in making some interesting experiments connected with this invention, and to test the effect of length of wire on the magnetizing influence of voltaic electricity."*

Mr. Vail has given the following account of his connection with the enterprise: "On the 2d of September, 1837, the author with several others witnessed the first exhibition of this electric telegraph, and soon after became a partner with the inventor. Immediate steps were taken for constructing an instrument for the purpose of exhibiting its powers before the members of Congress. This was done at the Speedwell Iron Works, Morristown, N. J. and exhibited in operation with a circuit of two miles. A few days after, it was again exhibited at the University of the City of New York, for several days, to a large number of invited ladies and gentlemen." †

About a month after this "successful experiment," (on the 6th of October, 1837,) Professor Morse filed in the United States Patent Office a "caveat," signed October 3, stating in the petition (dated five days earlier) "that the machinery for a full practical display of his new invention is not yet completed, and he therefore prays protection of his right till he shall have matured the machinery." The specification declares: "I have invented a new method of transmitting and recording intelligence by means of electro-magnetism: . . . for the purpose aforesaid, I have invented the following apparatus, namely: First, a system of signs by which numbers, and consequently words and sentences, are signified; second, a set of type adapted to regulate and communicate the signs, with cases for convenient keeping of the type, and rules in which to set up the type; third, an apparatus called a port-rule, for regulating the movement of the type-rules, which rules by means of the type in their turn regulate the times and intervals of the passage of electricity; fourth, a register which records the signs permanently; fifth, a dictionary or vocabulary of words numbered and adapted to this system of telegraph; sixth, modes of laying the conductors to preserve them from injury." These several parts are then more particulary described. "The signs are the representatives of numerals." The register comprises an electro-magnet actuating by its armature a lever or pendulum carrying a pencil or fountain pen, or small printing wheel, for marking on a strip or sheet of paper as already described. The modes of laying the conductors are by insulating the wires with silk or cotton wrapping, and coating with caoutchouc or other non-conductor, and also by inclosing them in iron, lead, or wooden tubes. The document concludes: "What I claim as my invention, and desire to secure by letters

*Silliman's *Am. Jour. Sci.* October, 1837, vol. xxxiii, p. 187.
†A. Vail's *Electro-Magnetic Telegraph*, 8vo. 1845, p. 154.

patent and to protect for one year by a caveat, is a method of recording permanently electrical signs which by means of metallic wires or other good conductors of electricity, convey intelligence between two or more places."

Of the above described apparatus, the two most important features were those numbered the first and the fourth,—the system of signs and the recording device; and though neither of these presented much originality, the method of the former being that long established for naval signals, and the clock-moved fillet of the latter being essentially the arrangement long employed for self-registering instruments generally, yet the *combination* of these parts with the others undoubtedly possessed great practical merit; and none the less that the several elements were evidently worked out independently by the inventor. It is not a little remarkable however, that of the specified six parts of this earliest invention of Professor Morse, *not one* enters into the established "Morse telegraph" of to-day. That feature regarded by the inventor as its vital and fundamental characteristic (the fourth), the subject of his formal "claim," survived the longest; but after undergoing considerable modification, it has for more than twenty years been neglected and abandoned.

In response to a public circular which had been issued by the Secretary of the Treasury, March 10, 1837, "with a view of obtaining information in regard to the propriety of establishing a system of telegraphs for the United States," Professor Morse addressed a communication to the honorable Secretary, dated September 27, 1837, pointing out the disadvantages of the old mechanical telegraphs as being "useless the greater part of the time:" (as in foggy weather and during the night.) He then proceeded: "Having invented an entirely new mode of telegraphic communication, which so far as experiments have yet been made with it, promises results of almost marvelous character, I beg leave to present to the department a brief account of its chief characteristics." After stating that at the time when he first conceived the thought (some five years previously) he had "planned a system of signs and an apparatus to carry it into effect," he added, "although the rest of the machinery was planned, yet from the pressure of unavoidable duties I was compelled to postpone my experiments, and was not able to test the whole plan until within a few weeks. The result has realized my most sanguine expectations."

The construction of a more complete apparatus was carried on at the Speedwell Iron Works of the Messrs. Vail, near Morristown, while Professor Gale pursued his experiments at the New York City University.*

Having finished his laborious task of numbering a dictionary, October 24, 1837, Professor Morse gave more attention to the Vail Works.†

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* Professor Morse, writing to Mr. Alfred Vail, October 7, 1837, says: "Professor Gale's services will be invaluable to us, and I am glad that he is disposed to enter into the matter with zeal."

† "The dictionary is at last done. You cannot conceive how much labor there has been in it, but it is accomplished; and we can now talk or write anything by numbers." Professor Morse to A. Vail, October 24, 1837. (Prime's *Life of Morse*, chap. viii, p. 326.)

On his return from a visit to the works, he wrote back to Mr. Vail, on the 13th of November, 1837, "I arrived just in time to see the experiment Professor Gale was making with the entire ten miles, and you will be gratified and agreeably surprised when I inform you that the result now is that with a little addition of wire to the coils of the small magnet which I had all along used, the power was as great apparently through ten as through three miles. This result has surprised us all (yet there is no mistake), and I conceive settles the whole matter."

In a second communication to the Secretary of the Treasury, dated November 28, 1837, Professor Morse announced this encouraging success: "I informed you that I had succeeded in marking permanently and intelligibly at the distance of half a mile. Professor Gale of our university, and Mr. Alfred Vail, of the Speedwell Iron Works, near Morristown, N. J. are now associated with me in the scientific and mechanical parts of the invention.* We have procured several miles of wire, and I am happy to announce to you that our success has thus far been complete. At a distance of five miles, with a common Cruickshanks' battery of eighty-seven plates (four by three and a half inches, each plate), the marking was as perfect on the register as in the first instance of half a mile. We have recently added five miles more (making in all ten miles) with the same result; and we now have no doubt of its effecting a similar result at any distance."

On the completion of the new receiving and recording instruments at the Speedwell Iron Works, an experimental exhibition at the place, with three miles of coated copper wire, extended around a large factory-room, was made in the presence of a few friends, on the 6th of January, 1838; and on the 11th of January another exhibition was freely opened to the public. A report of the trial in a Morristown Journal explains how "the words were put up into numbers through the dictionary; the numbers were set up in the telegraph type in about the same time ordinarily occupied in setting up the same in a printing office; they were then all passed complete by the port-rule;" and being automatically recorded at the extreme end of the wire, "the marks or numbers were easily legible, and by means of the dictionary were resolved again into words."

Shortly after this, Professor Morse (or his assistant, Mr. Vail) devised for the first time a system of *alphabetic* symbols for his telegraph. It should not be forgotten that the vertical recording-lever of the original Morse appararatus was so arranged that it must necessarily mark a *continuous* line, either straight or zig-zag. It was never devised for an "alphabet," and was incapable of an intermittent dot or dash marking. The new instrument completed by Mr. Vail, and first operated on the

* In a letter to the Hon. Francis O. J. Smith, chairman of the Committee on Commerce, House of Representatives, dated February 15, 1838, Professor Morse writes: "It is proper that I should here state that the patent-right is now jointly owned in unequal shares by myself, Professor Gale, of New York City University, and Messrs. Alfred and George Vail." The patent was not actually issued till more than two years later.

6th of January, 1838, was differently organized, the recording-lever being for the first time arranged horizontally, and having an up and down movement, with an upright magnet under one end, and the moving fillet of paper above the other.*

On the 24th of January, 1838, an exhibition of the new apparatus and of its improved operation, was given at the New York City University, in the long room of the geological cabinet, through ten miles of wire; one of the five-mile reels being placed in the outgoing portion of the circuit, and the other five-mile reel on the returning line. On this occasion for the first time the words transmitted were entered, and recorded, in the new alphabet without the aid of the numbered dictionary.† The New York Journal of Commerce in noticing this performance remarked: "Professor Morse has recently improved on his mode of marking, by which he can dispense altogether with the telegraphic dictionary, using letters instead of numbers; and he can transmit ten words per minute, which is more than double the number which can be transmitted by means of the dictionary."‡

The instrument thus brought to a satisfactory working condition, was designed to be sent to Washington for exhibition to officers of the National Government, with a view of obtaining a grant from Congress for the construction of an actual line of telegraph between two cities. On the way from New York, the apparatus with its reels of wire was exhibited at Philadelphia, before a committee of the Franklin Institute (at its hall), on the 8th of February, 1838. The committee (whose chairman was Prof. Robert M. Patterson, then Director of the United States Mint at Philadelphia), after a careful examination, reported:

"The operation of the telegraph as exhibited to us was very satisfactory. The power given to the magnet at the register through a length of wire of ten miles, was abundantly sufficient for the movements required to mark the signals. The communication of this power was instantaneous." Referring then to the probable difficulties of efficient insulation, the committee proceeded: "Mr. Morse has proposed several plans; the last being to cover the wires with cotton thread, then varnish them thickly with gum-elastic, and inclose the whole in leaden tubes. More practical and economical means will probably be devised; but the fact is not to be concealed that any effectual plan must be very expensive.§ Doubts have been raised as to the distance to which the electri-

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*On the question of the origin and invention of the "Morse-Alphabet," see "Supplement," NOTE G.

†The message sent through the wire on this occasion (Wednesday, January 24, 1838,) is spoken of as "the first *sentence* that was ever recorded by the telegraph." (Prime's *Life of Morse*, 8vo. N. Y. 1875, p. 331.) It was the first employment of the rectilinear dot and dash symbols.

‡New York *Journal of Commerce* of January 29, 1838.

§[It is to be remembered that Gauss and Weber, as also Steinheil, at this date had in actual and successful operation telegraph lines several miles in length, whose naked wires through the air were insulated only at their points of support. Although this important discovery of Weber had been in practical and public operation for about five years, no particular account of it seems to have been at that time published in this country.]

city of an ordinary battery can be made efficient; but your committee think that no serious difficulty is anticipated as to this point. The experiment with the wire wound in a coil may not indeed be deemed conclusive. . . . It may be proper to state that the idea of using electricity for telegraphic purposes has presented itself to several individuals, and that it may be difficult to settle among them the question of originality. The celebrated Gauss has a telegraph of this kind in actual operation, for communicating signals between the University of Göttingen and his magnetic observatory in its vicinity. . . . In conclusion, the committee beg leave to state their high gratification with the exhibition of Professor Morse's telegraph, and their hope that means may be given to him to subject it to the test of an actual experiment made between stations at a considerable distance from each other." *

About the middle of February, (1838,) Professor Morse arrived in Washington with his instrument and his reels of wire, and exhibited the operation of the telegraph to many dignitaries of the executive and legislative branches of government. A memorial was presented to Congress by the inventor, asking an appropriation to defray the expense of an experimental line between two cities; which being referred to the Committee on Commerce by the House of Representatives, was favorably reported by that committee April 6, through its chairman, Hon. Francis O. J. Smith. "The committee agree unanimously that it is worthy to engross the attention and means of the Federal Government to the full extent that may be necessary to put the invention to the most decisive test that can be desirable;" and in accordance with this opinion, "the committee recommend an appropriation of thirty thousand dollars, to be expended under the direction of the Secretary of the Treasury; and to this end submit herewith a bill." This bill however failed to receive the support of the majority, and a favorable action on this measure was not obtained for several years.

Meanwhile Professor Morse had been engaged with a killful attorney in preparing papers with a view to obtaining a patent. The specification (signed April 7, 1838) includes, in addition to the several parts described in the earlier caveat of October 3, 1837, the recently-devised system of alphabetic signs, a rotary port-rule for continuous action and a combination of circuits or electro-magnetic "relays." The invention is described as "an application of electro-magnetism in producing sounds and signs, or either, and also for recording permanently by the same means . . . any signs thus produced." "It consists of the following parts: First, a circuit of electric or galvanic conductors," etc. "Second, a system of signs by which numerals and words represented by numerals, and thereby sentences of words, as well as of numerals, and letters of any extent and combination of each, are communicated." "Third, a set of type adapted to regulate the communication of the above-mentioned signs." "Fourth, an apparatus called the port-rule [straight or

* *Journal of Franklin Institute,* February, 1838, vol. xxi, n. s. pp. 105–108.

circular] which regulates the movement of the type." "Fifth, a signal-lever which breaks and connects the circuit of conductors."* "Sixth, a register which records permanently the signs communicated." "Seventh, a dictionary, or vocabulary of words, to which are prefixed numerals." "Eighth, modes of laying the circuit of conductors."

After filing his application in the Patent Office, in order not to be forestalled in his intended efforts to obtain patents in Europe, by his own patent being sent and published abroad, Professor Morse filed a request that its issue might be suspended till his return.

Although the favorable report on the Morse memorial to Congress, made to the House of Representatives by its committee, failed to secure the appropriation recommended, Mr. Francis O. J. Smith, the chairman, was so well satisfied of the merits of the new telegraph, that on leaving Congress he at once became a partner in the enterprise, and accompanied Professor Morse in his departure for London, May 16, 1838.†

In consequence of the opposition of Wheatstone and Cooke, who had obtained an English patent June 12, 1837, Professor Morse's application for a patent in Great Britain was refused by the attorney-general, Sir John Campbell, July 12, 1838, (after the exaction of heavy fees,) on an unquestionable judicial quibble. The ostensible ground of rejection was clearly not warranted by the spirit or intent of the English patent law, as the *details* of the patent sought, had never been published either in this country or abroad.‡

The success of the American inventor in France was practically no greater; for although a nominal patent for that country was obtained on August 18, 1838, it was rendered nugatory by the ingenious legal

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*Although the "signal-lever" is here specially indicated, it differs widely in construction, arrangement, and operation, from the modern signal-lever or transmitting key; having only the function in common with it of a circuit-breaker. In his pamphlet, published at Paris in 1867, giving an account of his invention, Professor Morse says: "At the time of the construction of this first telegraphic instrument, I had not conceived the idea of the present *key manipulator* dependent on the skill of the operator, but I presumed that the accuracy of the imprinting of signs could only be secured by mechanical mathematical arrangements and by automatic process." (*Modern Telegraphy*, etc. p. 25.) In his argument presented to Sir John Campbell, the attorney-general of England, July 12, 1838, he urges as an evidence of characteristic novelty, "These types form such an essential part of my invention, that without them the practical utility and value of my invention is for the most part destroyed, and full one-half of the mechanism is disconnected from it, and is of no use in it." The Morse lever must not therefore be confounded with the existing finger-key. "The spring-lever key, as at present used in the Morse office, was suggested by Mr. Thomas C. Avery, of New York, but has received various modifications." (Turnbull's *Electro-Magnetic Telegraph*, 1852, pp. 49, 50.)

†"With this understanding a partnership was formed between Professor Morse, Professor Gale, Mr. Alfred Vail, and Hon. F. O. J. Smith, by the terms of which it was stipulated that Mr. Smith should go to Europe with Professor Morse, and secure patents for the telegraph in such countries as it should be practicable for him to do so." (Prime's *Life of Morse*, chap. viii, p. 344.)

‡Notwithstanding their illiberal interference with Morse's application in 1838, Messrs. William F. Cooke and Charles Wheatstone had the "self-possession" eighteen months later each to write a letter to Professor Morse, (dated January 17, 1840,) begging him to join them in their efforts to obtain an American patent! As a characteristic illustration of official contrast, Messrs. Cooke and Wheatstone (contrary to their expectations), on their own application, secured an American patent without opposition or obstruction June 10, 1840, ten days before the issue of Morse's patent, applied for more than two years earlier.

conditions, first, that to prevent forfeiture the patented invention must be carried into successful operation in France within two years; and secondly, that all private persons, companies, or corporations, were prohibited from putting a telegraph into operation in France. Disappointed in various promising expectations, and discouraged by repeated failures, Professor Morse returned to New York, April 15, 1839.

In May, 1839, he visited Princeton, for the purpose of seeing Professor Henry and obtaining from him the solution of certain doubts;—his colleague, Dr. Gale, being then absent on business. During this his first interview with Henry, occupying an afternoon and evening, he received from the full and frank expositions of his host every satisfaction he desired; and he had the great encouragement of hearing from the lips of that cautious investigator, that he foresaw no difficulty in magnetizing soft iron through a wire "at the distance of a hundred miles or more."*

The application filed by Professor Morse in the United States Patent Office, before he visited Europe, was allowed, and issued as a patent June 20, 1840. (No. 1647.) This patent comprised nine claims: 1, the combination of type, rule, lever, &c.; 2, the recording cylinder, &c.; 3, the types, signs, &c.; 4, the making and breaking of the circuit by mechanism, &c.; 5, the combination of successive circuits; 6, the application of electro-magnets to several levers, &c.; 7, the mode and process of recording by the use of electro-magnetism; 8, the combination and arrangement of electro-magnets in one or more circuits, with armatures for transmitting signs; and 9, the combination of the mechanism described, with a dictionary of numbered words.

The appropriation asked for from Congress, though earnestly pressed at successive sessions, failed to obtain the sanction of the House of Representatives; until after a wearisome delay of five years, a bill was finally carried through Congress, March 3, 1843, authorizing an expenditure of "the sum of thirty thousand dollars, . . . for testing the capacity and usefulness of the system of electro-magnetic telegraphs invented by Samuel F. B. Morse, of New York."

The stations selected for connection by the new telegraph were Washington and Baltimore, about forty miles apart. In order to form two complete circuits for this distance, one hundred and sixty miles of copper wire, covered with cotton, were ordered and delivered at New York City. Before inclosing the four lines in pipes, as contemplated, Professor Morse prudently determined to experiment on the magnetizing effect through this continuous length of insulated wire. The result of this experiment, which fully justified the expectation of Henry expressed to him four years before, is thus stated in a letter addressed to the Secretary of the Treasury, August 10, 1843:

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* Prime's *Life of Morse*, chap. x, pp. 421, 422. Dr. Prime says of this visit, "A few days after receiving Professor Henry's kind invitation, Professor Morse went to Princeton, and passing the afternoon and evening with the great philosopher, returned the next morning to New York."

"The experiments alluded to were tried on Tuesday, and with perfect success. I had prepared a galvanic battery of three hundred pairs, in order to have ample power at command; but to my great gratification, I found that one hundred pairs were sufficient to produce all the effects I desired through the whole distance of one hundred and sixty miles. It may be well to observe that the hundred and sixty miles of wire are to be divided into four lengths of forty miles each, forming a fourfold cord from Washington to Baltimore. Two wires form a circuit; the electricity therefore in producing its effects at Washington from Baltimore, passes from Baltimore to Washington and back again to Baltimore, of course travelling eighty miles to produce its result. One hundred and sixty miles therefore gives me an actual distance of eighty miles; double the distance from Washington to Baltimore. The result then of my experiments on Tuesday, is that a battery of only a hundred pairs at Washington, will operate a telegraph on my plan eighty miles distant with certainty, and without requiring any intermediate station."

As it was part of the original plan (as set forth in the caveat of 1837) to lay the conducting wires underground, Professor Morse, in 1843, devised a method of forming a lead pipe around the group of prepared and insulated wires. that is of introducing the compound cord into the pipe in the process of its construction. He obtained a patent for this project October 25, 1843, (No. 3316,) claiming "the method of introducing wires into hollow pipes whilst making the same, by introducing the wires through a hollow mandrel on which the pipe is made." This process was practically carried out, though with the extreme risk of constantly impairing the insulation of the wires by the operation.

Professor Gale has given the following account of the method of laying the telegraph line and of the result. "A plow was used, with a share running two and a half feet deep, and carrying a coil of insulated wire inclosed in a coil of lead pipe which the plow deposited in the ground and covered as the plow progressed. Forty miles of lead pipe were made in New York in the autumn of 1843, and shipped to Baltimore in the end of November. Up to this date I had been engaged in New York inspecting the manufacture of the lead pipe and charging the same with the insulated wire fed into the pipe by machinery while the pipe was drawn. I reached Baltimore in the early part of December, and learned that the party had nearly reached the Relay House. Nine miles had been laid; on inspection of which, not one mile of wire was found to be sufficiently insulated to carry the electric current from end to end of the reach."*

The plan was finally abandoned early in 1844, after more than half of

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* *Morse Memorial*, Washington, 1875, pp. 18, 19. Steinheil, in 1837, remarked: "Numerous trials to insulate wires and to conduct them below the surface of the ground have led me to the conviction that such attempts can never answer at great distances, inasmuch as our most perfect insulators are at best but very bad conductors. And since in a wire of very great length the surface in contact with the so-called insulator is uncommonly large when compared with the section of the metallic conductor, there necessarily arises a gradual diminution of force." (Sturgeon's *Annals of Electricity*, etc. April, 1839, vol. iii, p. 510.)

the appropriation had been expended.* In March, 1844, it was decided to put the wires on poles, after the manner successfully adopted by Weber at Göttingen eleven years before. The different plans of insulating support proposed, were submitted by Professor Morse to Henry for his opinion, and he decided in favor of Mr. Ezra Cornell's plan of separating the wires as far apart as convenient, and attaching each wire to an independent glass insulator.† The line was accordingly erected on this plan; and by the middle or latter part of May, 1844, was completed from Washington to Baltimore. On the 24th of that month, the first formal message was transmitted through it between the two cities, and recorded by the electro-magnet in the dot-and-dash alphabet.‡ From this time the success of the electric telegraph in the United States was assured, and its extension over our broad domain was comparatively rapid.

This prolonged review of the history of the "Morse telegraph" has been ventured upon in this connection, partly to bring out into just relation and relief one or two important points, and in part to illustrate the gradual progress of development of the system, in the career of a single inventor. With that strong "subjectivity" (perhaps essential to the success both of the artist and of the artisan) which characterized him, Professor Morse always believed his invention to have been practically full-fledged at its birth, or rather at its conception; and quite unconscious of the slow and small advances derived from gathered experience or external suggestion, failed seemingly to realize how completely his earlier methods were discarded and displaced by later improvements.§

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*Professor Morse says: "It was abandoned, among other reasons, in consequence of ascertaining that in the process of inserting the wire into the leaden tubes (which was at the moment of forming the tube from the lead at melting heat) the insulated covering of the wires had become charred at various and numerous points of the line to such an extent that greater delay and expense would be necessary to repair the damage than to put the wire on posts." (Prime's *Life of Morse*, chap. xi, p. 478.)

†Mr. Cornell afterward distinguished himself by devoting, in 1865, half a million of dollars from the profits of his telegraphic enterprises, to the founding at Ithaca, N. Y. of the university bearing his name. He subsequently contributed nearly as much more; making his total endowment in the neighborhood of a million dollars.

‡The completion of the experimental telegraph authorized by act of Congress was thus formally announced by Professor Morse to the Secretary of the Treasury, under whose direction the appropriation had been placed: "Washington, June 3, 1844. SIR: I have the honor to report that the experimental essay authorized by the act of Congress on March 3, 1843, appropriating 30,000 dollars for testing my system of electro-magnetic telegraph, 'and of such length and between such points as shall test its practicability and utility,' has been made between Washington and Baltimore, a distance of forty miles, connecting the Capitol in the former city with the railroad depot in Pratt street in the latter city. . . ." This was six years after the English line of thirteen miles had been in operation. While Lomond, in 1787, and Steinheil, in 1837, had employed but a single wire for transmitting messages from either end, Morse, in 1844, required two circuits of four wires for the same performance; one pair of wires for the outward and one pair for the inward passage.

§In a letter addressed to Donald Mann, esq., December, 1852, Professor Morse rather quaintly remarks: "In elaborating the invention in its earlier stages, many modifications of its various parts were tried, and many of the supposed improvements then deemed necessary to its perfection have since been found unnecessary and useless." (*American Telegraph Magazine*, December 15, 1852, vol. i, No. 3, p. 130.)

Morse's "first conception."—After a three years' sojourn in Europe, from 1829 to 1832, spent principally in Italy, devoted exclusively to the study and pursuit of his art as painter, Mr. Morse on his homeward voyage from France in the ship Sully, formed the acquaintance of Dr. Charles T. Jackson, of Boston, a fellow-passenger. He first "conceived the idea" of an electric telegraph on the 19th of October, 1832, from a conversation with Dr. Jackson on the subject; and the suggestion impressed him with the surprise of a truly new conception. His first thought appears to have been the application of electricity or galvanism to a chemically recording telegraph; and this project, laid aside for that of the electro-magnet, was afterward revived and cherished, till in 1849, he procured a patent for it, as already stated.

Professor Morse in his letter to Dr. C. T. Jackson, dated September 18, 1837, controverting the claim of the latter to a share in the invention of the electric telegraph, says: "I lose no time in endeavoring to disabuse your mind of an error into which it has fallen in regard to the electro-magnetic telegraph. You speak of it as 'our electric telegraph,' and as a 'mutual discovery.' . . . I have a distinct recollection of the manner, the place, and the moment, when the thought of making an electric wire the means of communicating intelligence, first came into my mind. . . . We were conversing on the recent scientific discoveries in electro-magnetism; . . . I then remarked, this being so, if the presence of electricity can be made visible in any desired part of the circuit, I see no reason why intelligence might not be transmitted instantaneously by electricity. You gave your assent that it was possible. . . . I asked you if there was not some mode of decomposition which could be turned to account. You suggested the following experiment, which we agreed should be tried together, if we could meet for that purpose. It was this: to decompose by electricity glauber salts upon the paper which was first to be colored with turmeric." The writer then argues that this plan not having been jointly tried, and an entirely different device (the electro-magnet) having been adopted by himself, there was no joint invention.*

In his letter to Dr. C. T. Jackson, dated December 7, 1837, Professor Morse says: "I consulted you to ascertain if there were not some substance easily decomposed by the simple contact of a wire in an electric state. It was then, and not till then, that you suggested turmeric paper dipped in a solution of sulphate of soda. . . . I do not charge you with intentional neglect; I readily allow your excuses for not trying the experiments; but these excuses do not alter the fact that your neglect retarded my invention, and compelled me after five years' delay, to consider the result of that experiment as a failure, and consequently to de-

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* Amos Kendall's *Full Exposure of Dr. Charles T. Jackson's Pretensions*, etc. First edition, N. Y. 1850. Second edition, printed in Paris, 1867: pp. 64, 65. Neither Professor Morse nor Dr. Jackson was aware that the project had been suggested seventeen years before, by Dr. J. R. Coxe, of Philadelphia; and that it had been successfully tried four or five years before, by Mr. H. G. Dyar, of New York.

vise another mode of applying my apparatus,—a mode entirely original with me."*

In a letter to Mr. Alfred Vail, not long after having formed a partnership with that gentleman, he wrote: "I claim to be the original suggester and inventor of the electric magnetic telegraph, on the 19th of October, 1832, on board the packet-ship Sully, on my voyage from France to the United States, and consequently the inventor of the first really practicable telegraph on the electric principle."† Some ten years later he wrote to Professor Walker: "It is at the date, 1832, of Baron Schilling's invention of his needle-telegraph (since abandoned as impracticable from various and obvious causes), that I conceived my electro-magnetic telegraph, and first devised an apparatus applying magnetism produced by electricity or the power of the electro-magnet to imprint characters at a distance."‡ And such was ever his firm conviction. Some twenty years later, he wrote at Paris: "If it be asked why I have assumed the date of the year 1832 as a standpoint, I reply, because at that date the idea was first conceived, and the process and means first developed."§

The invention however as unfolded in his caveat of October 3, 1837, is sufficiently embryonic for physiological study; and though our patent law, on grounds of sound policy, excludes all evidence of the inception of a foreign competitive invention, admitting only perfected and fully published details successfully to interfere (in a question of priority) with the first suggestions of the American inventor,‖ obviously no such patriotic rule is admissible in any scientific history of the progress of actual discovery. Interesting as the earliest gleams of a successful application and invention undoubtedly are, they are too little accessible to impartial investigation to claim the prerogative of a recognized chronology.

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* This letter seems very positively to exclude the claim to having "conceived the idea" of the *magnetic* telegraph in 1832.

† Vail's *Electro-Mognetic Telegraph*, 1845, p. 154.

‡ Morse's letter to Professor Sears C. Walker, dated Washington, January 31, 1848. The writer is excusable for assuming 1832 as the date of Baron Schilling's invention, (the date of his return from China,) as this is the date usually assigned in the popular text-books. Schilling's invention however so far from being either "impracticable" or "abandoned," is the essential basis of the telegraph now in use throughout England.

§ *Modern Telegraphy*, a pamphlet by S. F. B. Morse. Paris, 1867, p. 10. In a letter to Donald Mann, esq. (editor of the Telegraph Magazine), dated "Poughkeepsie, December, 1852," Professor Morse stoutly maintained his claim to priority of practical development (if not of first conception) of an electric recording telegraph; and with paternal exaggeration he declared, of his first crude experiment at the close of the year 1835, "The truth is, the child was born, and breathed, and spoke, in 1835. It had then all the essential characteristics of the future man." (*American Telegraph Magazine.* December 15, 1852, vol. i, No. 3, p. 130.) Its first transmission of an intelligible message was made September 2, 1837.

‖ "Whenever it appears that a patentee at the time of making his application for the patent believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country before his invention or discovery thereof, if it had not been patented or described in a printed publication." (*Act of July* 4, 1836, section 15, *Revised Statutes*, app ved March 2, 1877, title lx, sec. 4923.)

Whether judged by the standard of original conception, of practical operation, or of actual introduction into use, the Morse telegraph must be assigned a position tolerably low down in the list.* More than sixteen years before Professor Morse's first conception of the idea, Dr. J. R. Coxe, professor of chemistry in the University of Pennsylvania, at the beginning of 1816, "conceived the idea" of a practical electro-chemical telegraph, whose signals should be permanently *recorded* by the decomposition of metallic salts;† the precursor of Dyar's electro-chemical telegraph, successfully operated in 1828, (about five years before Morse's first conception,)—of Bain's electro-chemical telegraph, (patented December 12, 1846,)—and of Morse's electro-chemical telegraph, (patented May 1, 1849,) a third of a century afterward. Schilling's electro-magnetic telegraph developed to a "practical operation" in 1823, certainly before 1825, preceded that of Morse more than a dozen years. And the electro-magnetic telegraph of Gauss and Weber (certainly "conceived" before 1832) was in actual use and employment more than ten years before the similar establishment by Professor Morse; while that of Steinheil, probably conceived as early, was some eight years earlier than his in its practical introduction into use.‡

That Professor Morse would greatly have expedited his own improvements, and have saved himself a large amount of wasted time and labor, if he had studied more carefully the state of the art at the commencement of his experiments in 1835, is sufficiently obvious. But his complete unconsciousness—not only of the earlier successes of others in developing the galvanic telegraph, but of even the elementary facts of scientific history bearing on the problem, as well at the time of his original "conception" on board the ship Sully from the fecundating suggestion of Dr. Jackson, as during the years following, in which the invention was being slowly matured,—would be incredible on any other testimony than his own. In his first letter to the Secretary of the Treasury, dated September 27, 1837, he announced "having invented an entirely new mode of telegraphic communication." In a letter to Mr. A. Vail, some time afterward, he wrote: "I ought perhaps to say that the conception of the idea of an electric telegraph was original with me at that time, and I supposed that I was the first that had ever associated the two words together, nor was it until my invention was completed and had been successfully operated through ten miles, that I for the first time

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* Nearly two years before Professor Morse had met with Dr. C. T. Jackson, Henry had "conceived" and executed an experimental electro-magnetic telegraph, of a mile circuit.

† Thomson's *Annals of Philosophy*, February, 1816, vol. vii, p. 163.

‡ In a letter to his daughter dated July 26, 1838, (written from Havre, just on his arrival in France from London,) Professor Morse says somewhat curiously of the telegraph of Wheatstone, "he has invented his I believe without knowing that I was engaged in an invention to produce a similar result; for although he dates back to 1832, yet as no publication of our thoughts was made by either, we are evidently independent of each other." (Prime's *Life of Morse*, chap. ix, p. 358.) The popular infatuation in England as to the originality and priority of the Cooke and Wheatstone telegraph is probably quite equal to that prevalent in America as to the superior claims of the Morse telegraph. Wheatstone's *scientific* distinction or his title to enduring fame, fortunately does not repose on his telegraph.

learned that the idea of an electric telegraph had been conceived by another." *

Some time earlier than this, or five years after their conversations on ship-board, Professor Morse wrote to Dr. Jackson, (in a letter dated August 27, 1837, seeking his indorsement of the writer's originality in electrical telegraphy,) and avowed: "I claim for myself, and consequently for America, priority over all other countries in the invention of a mode of communicating intelligence by electricity!" In a second letter to the same person, dated New York City University, September 18, 1837, acknowledging his correspondent's original introductory remarks on electricity and electro-magnetism during their homeward voyage, but differing from him as to some of the consequent circumstances, he affirmed: "I then remarked, this being so, if the presence of electricity can be made visible in any desired part of the circuit, I see no reason why intelligence might not be transmitted instantaneously by electricity!" And in the same letter he contended, "The *discovery* is the original suggestion of conveying intelligence by electricity.† The *invention* is devising the mode of conveying it. The discovery, so far as we alone are concerned, belongs to me: and if by an experiment which we proposed to try together we had mutually fixed upon a successful mode of conveying intelligence, then we might with some propriety be termed mutual or joint inventors. But as we have never tried any experiment together, nor has the one proposed to be tried by you, been adopted by me, I cannot see how we can be called mutual inventors. You are aware perhaps that the mode I have carried into effect after many and various experiments with the assistance of my colleague, Professor Gale, was never mentioned either by you or to you.‡ . . . I have always said in giving any account of my telegraph, that it was on board the ship during a scientific conversation with you that I first conceived the thought of an electric telegraph. I have acknowledgments of similar kinds to make to Professor Silliman and Professor Gale, . . . and to the latter I am most of all indebted for substantial and effective aid in many of my experiments. If any one has a claim to be mutual inventor on the score of aid by hints, it is Professor Gale; but he prefers no claim of the kind."§ In his third letter, dated New York City

* Vail's *Electro-Magnetic Telegraph*, p. 154.

†Professor Morse's conception of "discovery" does not appear to have been very profound.

‡ [Another explicit statement that he did not "conceive the idea" of the *magnetic* telegraph in 1832, or on board the ship Sully.]

§ Dr. Jackson in his reply, dated Boston, November 7, 1837, said: "This claim of yours is to me a matter of surprise and regret. . . . You will not I presume venture to maintain that you at that time knew anything about electro-magnetism more than what you learned from me. . . . I am certainly desirous of doing you justice to the fullest extent, and have always spoken of your merits as I hope I shall always have occasion to do. . . . Honor to whom honor is due shall be my motto, and I must I believe fail in this duty if I should say that the first idea of an electro-magnetic telegraph was conceived by an American citizen. . . . The 'discovery' is not then to be claimed by us. I have invented a new instrument; so perhaps you have, for I do not yet know what your new one is, since you say I have not seen it nor heard about it beyond your announcement."

University, December 7, 1837, Professor Morse reiterated: "Your memory and mine are at variance in regard to the first suggestion of conveying intelligence by electricity. I claim to be the one who made it, and in the way which I stated in my letter to you. . . . The idea that I had made a brilliant discovery, that it was original in my mind, was the exciting cause and the perpetual stimulus to urge me forward in maturing it to a result. Had I supposed at that time, that the thought had ever occurred to any other person, I would never have pursued it; and it was not till I had completed my present invention, that I was aware that the thought of conveying intelligence by electricity had occurred to scientific men some years before. . . . The single scientific fact ascertained by Franklin, that electricity can be made to travel any distance instantaneously, is all that I needed to know, aside from mathematical and mechanical science, in order to plan all I invented on board the ship."*

These extracts sufficiently show the distinguished inventor's profound incomprehension, as well of the nature of the problem to be solved, as of the scientific principles involved in surmounting his fundamental difficulties. That his colleague, Professor Gale, should by the mere application of existing knowledge and established fact, make his magnetic signals operative through successively increasing lengths of wire until ten miles were included in the circuit, appeared—if remarkable, at least quite natural. That any special credit should be due to any one but himself and his invention, in the accomplishment of such a result, appeared no less unnatural and irrational: and Dr. Gale has recorded "Professor Morse's great surprise" when his attention was first called to Henry's paper in Silliman's Journal of January, 1831, a year or two after his magnet and battery had been so modified in accordance therewith as to correlate them in "intensity." That even then the inventor understood the real import of the paper is rendered doubtful by subsequent developments: his surprise being apparently excited mainly by Henry's suggestion that his researches were "directly applicable to the project of forming an electro-magnetic telegraph."

Prof. Sears C. Walker, the eminent astronomer, in a deposition taken in a telegraph suit of "French *vs.* Rogers," has thus recorded his recollection of an interesting interview between Professors Henry, Morse, and Gale, in January, 1848, at which he was present: "The result of the interview was conclusive to my mind that Professor Henry was the sole discoverer of the law on which the 'intensity' magnet depends for its power of sending the galvanic current through a long circuit. I was also led to conclude that Mr. Morse in the course of his own researches and experiments, before he read Professor Henry's article before alluded to, had encountered the same difficulty Mr. Barlow and those who preceded him had encountered; that is the impossibility of forcing the galvanic

* *Full Exposure of Dr. Charles T. Jackson's Pretensions*, etc. By Amos Kendall. 1st ed. 1850; 2d ed. printed in Paris, 1857: pp. 61–74.

current through a long telegraph line. His own personal researches had not overcome this obstacle. I also learned at the same time, by the conversations above stated, that he only overcame this obstacle by constructing a magnet on the principle invented by Professor Henry, and described in his article in Silliman's Journal. His attention was directed to it by Dr. Gale."*

In consequence of this friendly interview, Professor Morse, with a frankness creditable to the natural impulses of his character, a short time afterward addressed a letter to Professor Walker, from which the following extracts are made:

"WASHINGTON, January 31, 1848.

"DEAR SIR: I have perused with much interest that part of your manuscript entitled 'Theory of Morse's Electro-Magnetic Telegraph,' which you were so kind as to submit to my examination. The allusion you make to 'the helix of a soft-iron magnet prepared after the manner first pointed out by Professor Henry,' gives me an opportunity of which I gladly avail myself, to say that I think justice has not hitherto been done to Professor Henry, either in Europe or this country, for the discovery of a scientific fact which in its bearing on telegraphs, whether of the magnetic needle or electro-magnet order, is of the greatest importance. . . . Thus was opened the way for fresh efforts in devising a practicable electric telegraph; and Baron Schilling, in 1832, and Professors Gauss and Weber, in 1833, had ample opportunity to learn of Henry's discovery, and avail themselves of it, before they constructed their needle telegraphs.† . . . To Professor Henry is unquestionably due the honor of the discovery of a fact in science which proves the practicability of exciting magnetism through a long coil or at a distance, either to deflect a needle or magnetize soft iron. . . .

"With great respect, your obedient servant,

"SAMUEL F. B. MORSE."

This just and honorable recognition was well calculated to reflect an added luster, in the minds of the intelligent, upon Professor Morse's unquestionable achievements. But the writer a few years later, perhaps embittered by the sweeping constructions placed by hostile advocates upon the enforced statements of Henry (exacted in strongly-contested litigations between rival telegraph inventors or their sustaining companies), was unfortunately led in evil hour by flattering partisans to undo this gracious work.

In a pamphlet essay dated Locust Grove, New York, December, 1853, and published in January, 1855, Professor Morse hazarded the intrepid

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* *The case of French* vs. *Rogers*. Respondent's evidence, p. 199. Quoted by President Felton: *Smithsonian Report* for 1857, pp. 94, 95. The attention of Professor Morse was in reality not called to Henry's discovery by Dr. Gale, till a considerable time after it had been successfully applied to the experimental circuits of the infant telegraph.

†[Schilling's telegraphic experiments (involving no great length of circuit) were earlier than Henry's discoveries; and the expedient of so delicate an indicator as the reflecting galvanometer employed by Gauss and Weber seems to show that they had not adapted fully the electric current to the "intensity" coil, as recommended by Henry.]

statement: "First. I certainly shall show that I have not only manifested every disposition to give due credit to Professor Henry, but under the hasty impression that he deserved credit for discoveries in science bearing upon the telegraph, I did actually give him a degree of credit not only beyond what he had received at that time from the scientific world, but a degree of credit to which subsequent research has proved him not to be entitled. Secondly. I shall show that I am not indebted to him for any discovery in science bearing on the telegraph; and that all discoveries of principles having this bearing were made, not by Professor Henry, but by others, and prior to any experiments of Professor Henry in the science of electro-magnetism."*

In the inevitable dilemma thus assumed by the pamphleteer, under the clear light of historic record, it is most charitable not to impugn the writer's *candor*. The evidences diligently gathered by him, of electric impulse transmitted to great distances, before the date of Henry's investigations, certainly *seem* to show a surprising misconception of the phenomena and the principles of electro-magnetism. That with such misconception he should fail to appreciate an indebtedness to Henry's labors, is perhaps not surprising; but that he should thus ignore the services and statements of his faithful friend and colleague—Professor Gale, his great obligations to whom had been constantly admitted, appears less amenable to explanation or excuse.

Professor Morse could say with undoubted truth, that not till after the successful working of his invention, had he ever heard of Henry's researches. In his letter to Professor Walker, just above quoted, in referring to the time and the nature of his invention, he wrote: "I was utterly ignorant that the idea of an electric telegraph of any kind whatever, had been conceived by any other person. I took it for granted that the effects I desired could be produced at a distance; and accordingly in the confidence of this persuasion, I devised and constructed my apparatus for the purpose. I had never even heard or read of Professor Henry's experiments, nor did I become acquainted with them until after all my apparatus was constructed and in operation through half a mile of wire, at the New York City University, in 1837. I then learned for the first time that an electric telegraph of some kind had been thought of before I had thought of it." In his pamphlet of January, 1855, he mentions that at the date of Henry's publication in Silliman's Journal, he was sojourning in Italy. "From the autumn of the year 1829 till the autumn of the year 1832 I was in Europe, principally in Italy. . . . The fact is, it did not come to my knowledge until five years after my return, in 1837."†

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* *A Defence against the injurious deductions drawn from the deposition of Prof. Joseph Henry* [in the several telegraph suits]; by Samuel F. B. Morse, January 1855, p. 8. (See "Supplement," NOTE H.)

† Morse's *Defence against the injurious deductions*, etc. (p. 15, and foot-note). Thus while Morse—dreaming only of artistic fame, was assiduously cultivating his art in Italy, nearly two years before he met with Dr. Jackson on the homeward ship, or before the conception of electric signaling had dawned upon his mind, Henry had an electro-magnetic circuit of a mile, with bell signal, in actual operation at the Albany Academy.

Professor Gale, when asked in 1856, if he would give a statement for publication, of the Morse apparatus as originally constructed, and before being modified by himself, promptly responded in a letter dated Washington, April 7, 1856: "This apparatus was Morse's original instrument, usually known as the type apparatus, in which the types, set up in a composing-stick, were run through a circuit-breaker, and in which the battery was the cylinder battery, with a single pair of plates. The sparseness of the wires in the magnet coils, and the use of the single cup battery, were to me on the first look at the instrument, obvious marks of defect, and I accordingly suggested to the professor, without giving my reasons for so doing, that a battery of many pairs should be substituted for that of a single pair, and that the coil on each arm of the magnet should be increased to many hundred turns each: which experiment (if I remember aright) was made on the same day, with a battery and wire on hand, furnished I believe by myself: and it was found that while the original arrangement would only send the electric current through a few feet of wire, (say from fifteen to forty,) the modified arrangement would send it through as many hundred. Although I gave no reasons at the time to Professor Morse for the suggestions I had proposed in modifying the arrangement of the machine, I did so afterward; and referred in my explanations to the paper of Professor Henry, in the nineteenth volume of the *American Journal of Science*. . . . At the time I gave the suggestions above named, Professor Morse was not familiar with the then existing state of the science of electro-magnetism. Had he been so, or had he read and appreciated the paper of Henry, the suggestions made by me would naturally have occurred to his mind, as they did to my own. . . . Professor Morse expressed great surprise at the contents of the paper when I showed it to him, but especially at the remarks on Dr. Barlow's results respecting telegraphing."*

In a letter published in the Sunday Chronicle at Washington, in 1872, Professor Gale (strongly vindicating the propriety of erecting a monument to Professor Morse—not as a Discoverer but as an Inventor,) conceded that "Morse knew nothing of Henry's discovery when he invented his machine. Henry's discovery was published in 1831. Five or six years later Morse invented his telegraphic machine, without having seen an account of Henry's experiments till shown to him by myself."† And from this consideration he justly exonerates him from the imputation of plagiarism which had been inconsiderately brought against the distinguished inventor. In a letter addressed to Prof. E. N. Horsford, of Cambridge, Mass., dated Washington, May 18, 1872, the same writer said: "I adapted to Morse's machine the modification which was taken from Henry's experiments of 1831. [Properly of 1829, and 1830.] But Morse, not having been accustomed to investigate scientific facts, could not appreciate the investigations of Henry as applicable to the tele-

Smithsonian Report for 1857, pp. 92, 93.

†*Sunday Chronicle*, Washington, March 3, 1872.

graph; and I presume that Morse never did fully appreciate the benefit which his machine derived from Henry's discovery."*

Professor Morse's real merit (and his real contribution to telegraphy) consists, first, in the adaptation of the armature of a Henry electro-magnet to the purpose of a recording instrument, and secondly, in connection therewith, the improvement on the Gauss and Steinheil dual-sign alphabets, (made either by himself, or his assistant, Mr. Vail,) of employing, instead of alternating or vibratory markings, the simple "dot-and-dash" alphabet in a single line. Whatever may have been the indebtedness of Professor Morse to Dr. Jackson for the suggestion of the first idea of an "electric" telegraph, it is quite clear from the incoherent claims of Dr. Jackson himself, that these two really important improvements were original with Morse, and were in no sense derived from Jackson.†

Claims so moderate, though so meritorious, (as might be supposed) would scarcely satisfy the ambition of the patentee and his supporters, conscious of the equally meritorious exertion and enterprise by which through tedious ordeals of obstruction and difficulty a great practical success had been achieved, and before whom—in just reward—prophetic visions of a grand commercial monopoly loomed in large perspective. And thus by ignoring and undervaluing the results accomplished by those earlier in the field, the owners of the patent exerted themselves to repress competing systems, and to arrogate entire invention and proprietorship of the electro-magnetic telegraph.

To the vast majority—suddenly dazzled by so magnificent a culmination of invention, such claims appeared entirely legitimate; to the studious few—prepared to discriminate, they appeared as entirely inadmissible. The judicial tribunals—disposed to sustain a vested right with largest and most liberal interpretation, yet pronounced in final appeal such claims untenable and overstated.‡

To so eminent a pioneer in telegraphy as Henry, perhaps more than to any other, must the overweening pretensions of the "Morse Telegraph" have been obvious and untenable; and yet with that impartiality of judgment—that rare independency of personal bias which so marvelously distinguished him, he never permitted himself to underestimate Morse's true merits, nor did he abstain from defending them with a heartiness probably greater than was accorded by any of his scientific compeers. For Professor Morse personally he felt a sympathetic regard; which continued uninterrupted and unabated till the unfortunate epoch when he was so ungratefully assailed and so wantonly traduced.§

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* *Memorial of Samuel F. B. Morse.* (Meeting in Faneuil Hall.) Boston, 1872, p. 37.

† These two features so impressed the candid Steinheil, the foremost of telegraphers, as to lead him at once to accept them as great improvements on his own ingenious method of recording, and to urge at once their substitution.

‡ See "Supplement," NOTE I. § See "Supplement," NOTE J.

"Relay" and "receiving" circuits.—The somewhat controverted question as to the true origin of the relay system of electrical communication has been purposely reserved for a concluding discussion. Though unquestionably a valuable adjunct in distant intercourse, the "relay" is not here treated as an essential feature of the electric telegraph, since land-lines of 600 miles, and by the ocean system cables of 2,000 miles, are easily made operative in a single stretch or circuit.

Henry's original contrivance of a special compound circuit in 1835, (already noticed,) by no means precluded an equally original invention by Professor Morse some years later of a different arrangement of conjoined circuits. Nor is it at all surprising that a combination (in itself sufficiently obvious) should spontaneously occur to several minds if so circumstanced as to feel a need for it. There is reason to believe that Morse, like Wheatstone, independently invented his application of the general idea, and probably about the same time, in the spring of 1837.*

To do justice however to each party, it is all-important to discriminate carefully between the actual results attained by each. Henry had simply the philosophic plan of employing a weak magnetic power to act as a distant trigger for a great magnetic power, (one therefore of short circuit,)—and there stop.† Wheatstone, employing a delicate arrangement of silent galvanometer needle at the distant station, felt the necessity of promptly calling attention to the visual signal by an audible alarm; hence this feeble power was used also as the trigger to bring into action a much shorter and more powerful electro-magnetic circuit, —but merely as a *call*, and there stop. Morse, requiring a stronger signaling duty (in the use of a recording lever) than the length of the circuit would probably permit, conceived the idea of a division of the circuit into several shorter ones; each successive circuit to be *of the same kind* as the preceding. He thus *first* produced a true "relay," and this too without a knowledge of anything similar having been previously exhibited by Professor Henry as a lecture-room experiment before his college classes. It may therefore be affirmed that Henry, feeling no occasion for *extending* a telegraphic line, had probably no idea of a "relay," properly so called, when he first devised his combination of an "intensity" circuit with a "quantity" circuit; that Professor Morse, by his own declaration, had certainly no conception of a local receiving "quantity" magnet when subsequently he first devised his combination of a series of equal "intensity" circuits; and that Wheatstone had as little idea of either a "receiving" or a "relay" magnet when (in con-

*It even appears (from the unfortunate controversy between Messrs. Cooke and Wheatstone as to the priority and value of their respective contributions) that the two English copartners each independently invented the "relay" alarum. (*Professor Wheatstone's Answer* to Mr. Cooke's pamphlet. Republished in Cooke's "*Electric Telegraph*," etc. part i, p. 55, foot-note.)

†"My object in the process described by me was to bring into operation a large 'quantity' magnet connected with a 'quantity' battery in a local circuit, by means of a small 'intensity' magnet, and an 'intensity' battery at a distance." (*Smithsonian Report* for 1857, p. 112.)

junction with Cooke) he devised a "quantity" circuit supplementary to his "intensity" circuit for the sole purpose of calling "attention."

Professor Morse in his answer to the *twelfth cross-interrogatory* (in his deposition taken February 6, 7, and 8, 1851), in the case of "B. B. French and others *vs.* H. J. Rogers and others," has made the following statement: "If by the question is sought the date of my invention of breaking and closing one circuit by another, I answer in 1836 [?]. I exhibited the same in operation [?] in the spring of 1837. If by the question is sought the date of my invention of a short circuit to be used at the extremities of the line, I answer in May of 1844. If by the question is sought the date of a still greater improvement, to wit, that of placing short circuits on the margin (so to speak) of the main line, all of them to be operated simultaneously, I answer that the idea of such an improvement first presented itself to my mind in the beginning of the year 1844.* . . . The short circuits at the extremity of the main line were first used on the line between Washington and Baltimore, in May, 1844."†

These deliberate statements of Professor Morse distinguish very explicitly between the "relay" of magnets for "breaking and closing one circuit by another," and the "receiving" magnet of "a short circuit at the extremities of the line." And as a fact of public record, Morse patented the first of these devices June 20, 1840; (No. 1647;) while he did not patent the latter device (the "receiving" magnet of a local circuit) till about six years later, April 11, 1846: (No. 4453.)

On the same subject, Professor Gale has stated in his deposition: "The said Morse always expressed his confidence of success in propagating magnetic power through any distance of electric conductors which circumstances might render desirable. His plan was thus often explained to me. Suppose (said Professor Morse) that in experimenting on twenty miles of wire we should find that the power of magnetism is so feeble that it will but move a lever with certainty but a hair's breadth; that would be insufficient it may be to write or print, yet it would be sufficient to close and break another or a second circuit twenty miles farther; and this second circuit could in the same manner be made to break and close a third circuit twenty miles farther; and so on around the globe."

This is a very clear presentation of the "relay" of circuits. But with a slight confusion of idea Dr. Gale proceeds: "This general statement of the means to be resorted to, now embraced in what is called the '*receiving magnet*,' to render practical—writing or printing by telegraph through long distances, was shown to me more in detail early in the spring of the year 1837." To the same effect, nearly a quarter of a

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*[Steinheil, in 1837 (seven years earlier), had adapted his registering galvanometer "to repeat and render permanent *at all parts of the chain* where an apparatus like that above described is inserted," the information transmitted to the terminus. (Sturgeon's *Annals of Electricity*, etc. April, 1839, vol. iii, p. 520.)]

†*Deposition of Samuel F. B. Morse*, Circuit Court of the United States for the eastern district of Pennsylvania, April session, 1850, No. 104, "Complainant's Evidence," pp. 182, 183.

century later, Dr. Gale states that "Before lines of telegraph were set up, it was anticipated that in long lines the ordinary current of electricity might not be strong enough to work the magnet at such distance, so as to write, but would be so strong as to open and close a side or local circuit, as suggested by Professor Henry. This mode of using one electric circuit and magnet to open and close another electric circuit (either for extending the main circuit to greater distances or to operate any local circuit), although not in the machine when I first saw it, was *discussed* in an early part of 1837, before any lines had been constructed."*

In both these accounts, Professor Gale has inadvertently (though not unnaturally) confounded together two entirely distinct inventions, involving different arrangements and purposes;—the "relay" circuit and magnet (of the "intensity" order), and the "receiving" circuit and magnet (of the "quantity" order); although Professor Morse himself distinctly declared he had no conception of the latter arrangement in 1837, having invented it "in May of 1844."

While the first invention of the special application called the "relay" is thus unhesitatingly ascribed to Professor Morse, the practically much more important arrangement of the terminal or local short circuit "quantity" magnet for reinforcing the power of the "intensity" magnet, must as unhesitatingly be claimed for Henry; and as an invention several years prior to that of Morse, it would by the well-known principles of patent-law, have generically subordinated the special application of the latter. Although Henry did not technically "perfect the invention," it remains none the less true that every "receiving magnet" in use throughout our own and other countries is but the *obvious* application of Henry's experimental junction of the two circuits, exhibited eleven years before it entered into Professor Morse's patent of April 11, 1846.

As indicative of the relative importance of these two inventions,—the Henry "receiving" magnet and the Morse "relay" of circuits, it may be stated that on the extended lines of the "Western Union Telegraph Company," there are now 13,745 of the former in actual operation, and only 228 of the latter; being 60 of the Henry "receivers" for each of the Morse "repeaters." And in remarkable confirmation of Henry's early anticipations of the capacity of his "intensity" magnet to be operated under judicious conditions directly through a distance of several hundred miles, it is the "accomplished fact" to-day that numerous single circuits ranging from 500 to 600 miles in length, are in actual use in the United States, operated by his magnet. The telegraph-line from New York to New Orleans, (upward of 1,500 miles,) is worked in three links or circuits (connected by *two* relays or repeaters); the last circuit, from Chattanooga, Tenn. to New Orleans, La. being 638 miles long.†

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* Memorial of S. F. B. Morse, Washington, 1875, p. 19. On the question of the *date* of Professor Morse's "Relay", see "Supplement," NOTE K.

† These interesting facts are communicated by the accomplished telegraphic expert, Mr Frank L. Pope (of the Western Union Telegraph Company), a vice-president of the American Electrical Society: author of "Modern Practice of the Electric Telegraph:" &c.

Among examples of "magnetic" telegraphs which might properly here receive a passing notice, are the four following:

1837. The so-called "mechanical" or chronometric telegraph of Mr. William F. Cooke, of London, comprising two synchronously revolving cylinders (or escapements) at the two stations, arrested simultaneously by a magnetic armature detent, somewhat after the general principle of Ronalds's synchronous dials of 1816, previously mentioned. This form of dial telegraph was worked by Mr. Cooke in April, 1837.*

1837. The first letter-printing telegraph, devised by Mr. Alfred Vail, of New Jersey, in September, 1837, comprising a printing-wheel provided with spring type for the letters of the alphabet, projecting radially from its periphery, and corresponding with the teeth of an escapement wheel on the same shaft or axis, driven by ordinary clock-work, and regulated by a pendulum. The pendulum oscillating as a free armature between two electro-magnets, was arrested by one of the magnets when the desired letter was reached, and another electro-magnet, with lever armature, simultaneously drew down the spring type of the letter-wheel upon the fillet of paper beneath it.† This ingenious arrangement like the dial telegraph of Ronalds, and that of Cooke (independently contrived but a short time previously), required a synchronous movement of the clocks and their pendulums at the two stations. Eighteen years later, a printing telegraph on the same principle was very successfully worked out and operated by Mr. David E. Hughes, of Kentucky.

1838. The electro-magnetic chemical telegraph of Mr. Edward Davy, of London, comprising a chemically marking or recording cylinder, operated by a clock-work escapement and the armature of an electro-magnet. Relays of circuits were also included, operated by a galvanometer needle.‡

1839. The dial telegraph of Prof. Charles Wheatstone, of London, completed by him in November, 1839, comprising an escapement and index operated by the step-motion of an electro-magnetic armature. In this arrangement, the synchronous motions and indicating positions on the terminal dials were effected entirely by the specific number of galvanic impulses given to the transmitting and receiving escapements.§ The principle of this transmission was in 1846, skillfully and successfully applied by Mr. Royal E. House, of Vermont, to a "printing telegraph."

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* "Mr. Cooke's Case," before the arbitrators. *The Electric Telegraph*, etc. by W. F. Cooke, part ii, p. 23. It appears that this arrangement was devised by Mr. Cooke in 1836.

† *The American Electro-magnetic Telegraph*, by Alfred Vail, 1845, pp. 159–171.

‡ The *English patent* of Edward Davy, July 4, 1838, No. 7719.

§ "Professor Wheatstone's Case," before the arbitrators, in 1840. p. 101.

GENERAL SUMMARY.

From the foregoing partial history of the origin and development of the electro-magnetic telegraph, it is sufficiently demonstrated that its successful introduction has been effected by a considerable number of independent contributions. The leading preparatory investigations and discoveries which opened the way for the telegraph, (though with no such utilitarian end in view,) may be held to be:

1st: The discovery of galvanic electricity by Galvani (1786–1790).

2d: The galvanic or voltaic battery by Volta (1800).

3d: The directive influence of the galvanic current on a magnetic needle by Romagnosi (1802), and by Oersted (1820).

4th: The galvanometer by Schweigger (1820), the parent of the needle system.

5th: The electro-magnet by Arago and Sturgeon (1820–1825), the parent of the magnet system.

Passing these, the next most important series of steps in the evolution of our present system of telegraphy, and having a more or less conscious reference thereto, are:

First, and most vital: Henry's discovery in 1829, and 1830, of the "intensity" or spool-wound magnet, and its intimate relation to the "intensity" battery; whereby its excitation could be effected to a great distance through a very long conducting-wire.*

Second: Gauss's improvement in 1833, (or probably Schilling's improvement considerably earlier,) of reducing the electric conductors to a single circuit, by the ingenious application of a dual sign so combined as to produce a true alphabet.†

Third: Weber's discovery in 1833, that the conducting wires of an electric telegraph could be efficiently carried through the air, without any insulation except at their points of support.

Fourth: As a valuable adjunct to telegraphy, Daniell's invention of a "constant" galvanic battery in 1836.

Fifth: Steinheil's remarkable discovery in 1837, that the earth may form the returning half of a closed galvanic circuit, so that a single conducting-wire is sufficient for all telegraphic purposes.

Sixth: Morse's adaptation of the armature of a Henry electro-magnet as a recording instrument in 1837,‡ and in connection therewith the im-

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*Subordinated to this important step, the use of the armature as the signaling device and the first adoption of an acoustic signal might be mentioned. If Morse's "relay" be judged by any as of sufficient importance to rank with the more essential elements, then Henry's earlier and still more important device of the terminal short circuit magnet of "quantity" must not be overlooked.

†The probable anticipations of this,—by Lomond in 1787, by Cavallo in 1795, and by Dyar in 1825,—are here neglected, as neither sufficiently definite, nor as perhaps practically influential on the progress of telegraphy; though this recurrence of idea should certainly not be lost sight of in any history of the origins of inventions.

‡September of 1837 is fixed upon as the earliest date on which an actual register of intelligible signs was made by Professor Morse. (New York *Journal of Commerce*, September 7, 1837.) These signs were not *alphabetical*, but were zig-zag markings representing numerals.

provement in 1838, on the Schilling, Gauss, and Steinheil alphabets, of employing instead of alternating signs (as in his first register), the simple "dot-and-dash" alphabet in a single line.*

As displaying the "movement of an age," it is interesting to observe that these six capital steps were all effected within the fruitful period of a single decade. If we except the first of these—the inaugurating advance, without which no electro-magnetic telegraph would have been practicable,† it will probably be difficult for the impartial historian to award to the succeeding five contributions their respective value and just desert.

The earlier needle type of the electro-magnetic telegraph, as developed by Schilling and by Gauss, has found its special and appropriate application in extended ocean-lines; and indeed without such development, it is doubtful whether we could have had a transatlantic telegraph. It is well for the exclusive partisans of the "American system" to reflect that in the operation of these submarine cables there enters no element of Morse's instrument. The receiving and indicating mechanism devised by Gauss and Weber, and introduced some ten years earlier, is essentially that in use to-day on either shore of the Atlantic Ocean. The signals of the earlier invention are equal right and left deflections of an exceedingly delicate reflecting galvanometer; the signals of the later invention are the unequal contacts of an electro-magnetic armature.

Many other telegraphic developments—not within the object of this summary, such as the various modifications of the galvanometer system, the ingenious arrangements of dial indicators, and above all—as most ingenious of all—the printing telegraphs, (originating as we have seen, with Alfred Vail,) present what may be called highly organized varieties of the art; but varieties which notwithstanding the rare order of inventive intelligence expended upon them, and the great value possessed by them in special applications, do not promise to exercise a corresponding influence upon the future of telegraphy. The wonders of multiplex telegraphy (the simultaneous transmission of two or even four or more communications in either direction over the same wire), and of vocal telegraphy (the transmutation and transmission of human speech by electric waves in the telephone), lie still more beyond the scope of this review.

In conclusion, an early averment in this historic sketch, as to "the growth of the electric telegraph," may be repeated in the language of a later writer. "The history of the subject thus far shows us that no single individual can justly claim the distinction of having been the

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* Professor Morse's first use of the alphabet was made in January, 1838. (New York *Journal of Commerce*, January 29, 1838; also Prime's *Life of Morse*, 8vo, New York, 1875, p. 331.) On the subject of "Alphabetic notation" see "Supplement," NOTE L.

†Wheatstone himself does not appear to have fully realized the significance and value of Henry's researches till 1837. The simple electro-chemical telegraph might have been successfully developed without the discovery of the "intensity" magnet, and may yet prove in practice a formidable competitor with it.

inventor of the electric telegraph. It was in fact a *growth*, rather than an *invention*, the work of many brains, and of many hands." (Prescott's *Electricity and the Electric Telegraph*, 1877, chap. xxix, p. 420.)

But amid the galaxy of brilliant names who prepared the success and organized the triumph for the execution of skillful artisans, none stands higher, or shines with more resplendent luster, than that of

JOSEPH HENRY.

SUPPLEMENT.

NOTE A. (From p. 263.)

THE WORTH OF ABSTRACT RESEARCH.

The eminent natural philosopher Dr. Thomas Young, has well remarked: "No discovery however remote in its nature from the subjects of daily observation, can with reason be declared wholly inapplicable to the benefit of mankind. . . . Those who possess the genuine spirit of scientific investigation and who have tasted the pure satisfaction arising from an advancement in intellectual acquirements, are contented to proceed in their researches without inquiring at every step what they gain by their newly discovered lights, and to what practical purposes they are applicable. They receive a sufficient gratification from the enlargement of their views of the constitution of the universe, and experience in the immediate pursuit of knowledge that pleasure which others wish to obtain more circuitously by its means." *

In a similar spirit, Oersted expressed his clear perception in an anniversary address delivered in 1814, before the University of Copenhagen, that "The real laborer in science chooses *knowledge* as his highest aim. A love of knowledge, (which some are frequently obliged to place secondary to other duties,) with the man of science must be the occupation of his life; he is dedicated to nourish the holy flame of wisdom which shall diffuse its rays amidst the rest of mankind; it is his nightly lamp which shall enlighten the earth." †

And with no less earnestness and force, our own Henry declared: "While we rejoice that in our country above all others so much attention is paid to the *diffusion* of knowledge, truth compels us to say that comparatively little encouragement is given to its *increase*. . . . As soon as any branch of science can be brought to bear on the necessities, conveniences, or luxuries of life, it meets with encouragement and reward. Not so with the discovery of the incipient principles of science: the investigations which lead to these receive no fostering care from the government, and are considered by the superficial observer as trifles unworthy the attention of those who place the supreme good in that which immediately administers to the physical needs or luxuries of life. But he who loves truth for its own sake, feels that its highest claims are lowered and its moral influence marred by being continually summoned to the bar of immediate and palpable utility." ‡

In a plea for the endowment of abstract science, William Swainson, the naturalist, justly observes: "If the depths of science are to be fathomed, and new discoveries brought to light, the task can only be achieved by those whose time is at their own command, whose attention is not divided or distracted by avocations purely worldly, and whose circumstances are such as to make them free from pecuniary cares. Talents fitting their possessors for such speculations must be of a high order, and they are consequently rare: § yet still more rare it is to find superadded to them the gifts of fortune. From whom then if abstract science is to be fostered and rewarded, is

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* *Lectures on Natural Philosophy*, lect. i, vol. i, p. 2.

† *The Soul in Nature.* Bohn's Scientific Library, 1852, p. 141.

‡ *Smithsonian Report* for 1853, p. 8.

[§ Dr. Peter Mark Roget has well observed: "Important discoveries in science seem often to arise from accident; but on closer examination it is found that they always imply the exercise of profound thought. As the fertility of the soil is essential to the germination and growth of the seed which the wind may have scattered on its surface, so it is principally from the qualities of mind in the *observer* that an observation derives its value and may be made eventually to expand into an important branch of science." (*Galvanism*, 8vo, London, 1832, chap. i, p. 1.)]

this encouragement to come? Certainly not from the public; for what the multitude cannot appreciate they cannot be expected to reward. If indeed the speculations of the philosopher can be turned into immediate advantage by the manufacturer or the merchant, the inventor is in a fair way of dividing profits with the applier; but we are not at present considering such cases. . . . That discoveries which eventually have proved extensively applicable to commerce were never so suspected when their first rudiments were developed, is too notorious to be disputed; for the *discovery* and the *application* of a new principle require very different powers of mind. . . . It is a maxim of the vulgar to esteem every requirement of this sort in proportion to the direct benefit it confers on their own interests."*

It is indeed too true that the prosecution of scientific truth for truth's sake only, is popularly held in little favor, and instead of receiving assistance, is even unblushingly decried by the would-be leaders of industrial opinion. Taking no lessons from the splendid triumphs of the past, which constantly assure us that the discovery of one age—naked and unprized, is the necessary foundation for the invention of the next, intelligent editors still repeat the annual cry in superior judgment on the proceedings of learned associations, "Dispense, gentlemen, with these barren and uninteresting papers, and give us something 'practical.'"

The average citizen, professing a patronizing admiration of "science," is able perhaps to appreciate the physics of machinery, and the chemistry of manufactures. Eager for the rewards which may be won from nature by her students, he would gladly be taught some new magneto-electric process for converting cellulose into bread, or "oleomargarine" into butter; and yet in ignorant ingratitude, would as gladly monopolize the very thunderbolt, when Science once has forged it for the use of Art.†

But let those incapable of conceiving a higher utility than the material, at least exercise that prudent reason they so much vaunt, and at least endeavor to secure for that self-interest they so diligently pursue, the character of an *enlightened* policy. The unpromising preparation for a possible magnetic telegraph was quietly advanced by a fine succession of earnest students (little known or respected by the multitude), who never paused to query "the *use* of it," and who (it is safe to say) would never have accomplished their beneficent mission had their investigations been directly prompted by the inspirations of a mercenary interest.‡ It may be confidently proclaimed as a firm induction from all our past knowledge, that so intimately bound together is the entire framework and system of the world, that no extension of our observation of the phenomena of nature and of our insight into the laws of nature (which are the laws of God), is not either a direct advancement in physical power and well-being, or a necessary stepping-stone to other truths which shall prove such.

"Scientific researches are often supposed by the uninformed to be of little or no real importance, and indeed are frequently ridiculed as barren of all practical utility. But nothing is more mistaken than this. The most valuable and productive of the arts of life, the most important and wonder-working inventions of modern times, owe their being and value to scientific investigations. By these have been discovered physical truths and laws, the intelligent application of which to practical inventions has given immense benefits to the world. The germs of these valuable improvements and inventions have been found and developed by scientific research,—the original forms of which have often seemed to the many to be as idle and useless as they were curious." §

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*Swainson, *On the Study of Natural History* (Cabinet Cyclopædia), part iv, chap. ii, sects. 244, 245, pp. 354–357.

†"Science has scattered her material benefits so lavishly whenever she has been in presence, that no small number of her followers and all the multitude have left off gazing on the resplendency of her countenance, in their eager scramble for her gifts." (*Quarterly Review*, June, 1841, vol. lixviii, p. 185.)

‡Of those attempting the interrogation of nature "on account of the advantage and benefit to be derived from it," it may be said in Bacon's happy simile: "Like Atalanta, they leave the course to pick up the golden apple, interrupting their speed and giving up the victory." (*Novum Organum*, book i, aphorism 70, Bohn's edition, 1858, p. 407.)

§Report of special committee of the Board of Regents, on the distribution of the income of the Smithsonian fund. *Smithsonian Report* for 1853, p. 86.

And to the same effect let us quote in conclusion a few of Henry's urgent utterances. "Every well-established truth is an addition to the sum of human power; and though it may not find an immediate application to the economy of every-day life, we may safely commit it to the stream of time, in the confident anticipation that the world will not fail to realize its beneficial results."*

"Unfortunately there has always been in England and in this country a tendency to undervalue the advantages of profound thought, and to regard with favor only those investigations which are immediately applicable to the wants of the present hour. But it should be recollected that the scientific principles which at one period appear of no practical value, and are far removed from popular appreciation, at another time in the further development of the subject, become the means of individual prosperity and of national wealth."†

"The progress of society and the increase of the comfort and happiness of the human family depend as a basis on the degree of our knowledge of the laws by which Divine wisdom conducts the affairs of the universe. He has created us with rational souls, and endowed us with faculties to comprehend in some measure the modes in which the operations of nature are effected; and just in proportion to the advance we make by patient and persevering study in the knowledge of those modes or laws, are we enabled to apply the forces of nature to our own use and to avert the dangers to which we are exposed from our ignorance of their varied influences. Nearly all the great inventions which distinguish the present century, are the results immediately or remotely of the application of scientific principles to practical purposes; and in most cases these applications have been suggested by the student of nature, whose primary object was the discovery of abstract truth. The statement cannot be too often repeated, that each branch of knowledge is connected with every other, and that no light can be gained in regard to one which is not reflected upon all. Thus researches which at first sight appear the farthest removed from useful application, are in time found to have an important bearing on the advancement of art, and consequently on the progress of society."‡

"The world generally has failed to recognize the importance of abstract scientific truths. Although these truths constitute the most important elements of modern civilization, since they give man power and control over the inherent forces of nature, and enable him to render these the obedient slaves of his will,—yet there is even at this time, no country (however intelligent it may appear in other respects) that has made adequate provision for the discovery and development of these important principles."§

NOTE B. (From p. 273.)

THE ORIGIN OF THE GALVANOMETER.

In 1808, Johann Solomon Christian Schweigger, professor of natural philosophy at Nuremberg, and afterward at Halle, published a memoir "On the employment of the magnetic force for measuring the electrical." From the somewhat obscure description it appears however that the instrument he had devised was simply an "electroscope" for indicating the static repulsion of ordinary or mechanical electricity; the magnetic needle, armed at each end with a brass button, being mounted on an insulated stand or pivot, and used as a substitute for the torsion electrometer of Coulomb.‖ This arrangement therefore involved no principle of the galvanometer.

In 1811, De la Rive, in a letter to the editors of the "Bibliothèque Britannique," recounting some experiments, applied the term "galvanometer" to an instrument for

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* *Smithsonian Report* for 1856, p. 20.

† *Agricultural Report* of Commissioner of Patents for 1857, p. 420.

‡ *Smithsonian Report* for 1859, pp. 14, 15.

§ *Smithsonian Report* for 1866, p. 16.

‖ Gehlen's *Journal für die Chemie und Physik*, 8vo, Berlin, 1808, vol. vii, pp. 206–208.

measuring the quantity of the galvanic current by its decomposing energy.* Dr. Schweigger, in a notice of this paper, remarked that he had previously measured the battery force by the quantity of gases evolved from water in a given interval. † These experiments likewise, have evidently no relation to the present use of the term "Galvanometer."

Nine years earlier than this however, (or six years before Schweigger's needle electrometer,) the galvanic deflection of the magnetic needle had been distinctly observed and accurately recorded. For more than a century, repeated endeavors had been made to discover some relation between the magnetic and the electric attractions and repulsions, or to unite them by a single law. In 1774, a prize was offered by the Academy of Bavaria for the best examination of and dissertation on the question, "Is there a real and physical analogy between electric and magnetic forces?" Professor J. H. Van Swinden, of Franeker, Holland, one of the successful competitors, supported the conclusion that the similarities were entirely superficial, and that the two powers were essentially different in kind. On the other hand, Professors Steiclehner and Hubner contended that analogies so curious must imply a single agent. ‡

But the true reaction between these agencies could not well be exhibited until after 1800, when Volta devised his galvanic battery; which for the first time enabled physicists to employ a *continuous* electric current. Gian Domenico Romagnosi, a native of Northern Italy, a celebrated publicist and author of several works on historical, legal, and political philosophy, was led near the close of the last century to occupy himself for several years with scientific investigations. The electrical problem attracted his attention, and after varied experiments with the aid of the new galvanic appliance, his versatile activity was partly rewarded; he being first of physical inquirers to make the capital discovery of the singular directive influence exerted by the galvanic current on a magnetic needle. This new phenomenon—of which he could not anticipate the importance or the consequnces, was announced in the "Gazzétta di Trento" of August 3, 1802, an Italian newspaper published at Trent, in which city he had for many years resided. § If the channel of publication for a contribution to science of such value was unfortunate, the account was at least republished in forms better suited to arrest attention from the learned.

In a work of some note and merit, entitled "Essai Théoretique et Expérimental sur le Galvanisme," by Prof. Giovanni Aldini (a nephew of Galvani), quarto, published at Paris in 1804, the author, at page 191, alluding to the supposed magnetic influence of a galvanic circuit, states, "This new property of galvanism has been confirmed by M. Romanesi, a physicist of Trent, who has observed that galvanism produces a declination of the magnetic needle." This work was republished shortly afterward in two volumes octavo.

In the "Bibliothèque Universelle" (Sect. *Sciences et Arts*), January, 1821, (shortly after Oersted's announcement,) at page 75, attention is called to Aldini's Treatise on Galvanism, and the passage above given is quoted. The same notice and citation are also published in Gilbert's "Annalen der Physik," 1821, vol. lxviii, page 208.

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* *Bibliothèque Britannique*, for February, 1811, vol. xlvi.

† "On a Galvanometer." Schweigger's *Journal für Chemie und Physik*, 8vo, Nürnberg, 1811, vol. ii, part 4, pp. 424–434.

‡ Notwithstanding the plausibility of this supposition, it remains to the present day entirely unconfirmed. The conclusion of Van Swinden was correct. The only approach to a closer analogy since obtained, is the remarkable fact discovered by Ampère in 1820, that two insulated wires, free to move, through which electricity *is flowing* in the same direction, attract each other like two dissimilar magnetic poles; and that they repel each other when their currents are reversed, like two similar magnetic poles. But the differences between these forms of attraction are still so radical, as to incline some physicists to the opinion that the one (that of magnetism) is inherent and indestructible, and the other (that of electricity) is a merely kinetic or dynamic phenomenon: while others would regard the two as both kinetic.

§ Romagnosi was chief-justice at Trent, from 1791 to 1794; and in December of 1802, not long after his scientific achievement, he was made professor of law in the University of Parma.

In a still more popular work on galvanism, by Prof. Joseph Izarn, entitled "Manuel du Galvanisme," etc. octavo, published at Paris, in 1805, in section ix, at page 120, it is also stated: "According to the observations of Romagnési, a physicist of Trent, a magnetic needle being submitted to a galvanic current undergoes a declination." This work is referred to in a discussion by Mr. Latimer Clark, of London.* Lastly, in the memoir of Romagnosi contained in the "Nouvelle Biographie Générale" (edited by Hœfer), vol. xlii, pages 574, 575, it is mentioned, "He discovered the deviation of the magnetic needle by galvanism."

Although this pregnant discovery of Romagnosi appears to have been known both to Dr. Sœmmering and to Baron Schilling in 1815, yet to neither of them did it suggest any applicability to the purpose of telegraphy. Dr. Hamel, of St. Petersburg, in his interesting account of the early history of the telegraph, informs us: "I have been endeavoring to find out from the papers of Sœmmering whether he and Baron Schilling might have had a knowledge of the Italian Gian-Domenico Romagnosi's important discovery made many years ago, that the magnetic needle deviates from its normal direction when under the influence of the galvanic current, and of which he had published an account in a newspaper at Trent on the 3d of August, 1802. . . . I found that Baron Schilling, immediately after his return to Munich in 1815, communicated to Sœmmering the little book, 'Manuel du Galvanisme,' by Joseph Izarn, professor of natural philosophy at the Lycée Bonaparte, which was printed in Paris in 1805, and in which, on page 120, mention is made of Romagnosi's discovery. I have also seen a note from Sœmmering mentioning that he had read this treatise with attention. I came however to the conclusion that neither to Sœmmering nor to Baron Schilling, had any idea of a practical application of Romagnosi's observation presented itself."† Nor is this at all surprising: for the similar discovery and announcement by Oersted in 1820, would just as little have suggested any practical method of communicating intelligence to a distance. And indeed had the experiment been attempted, it would have resulted in absolute failure. It needed the keen brains and active hands of a succession of profound investigators,—of Schweigger, and Ampère, and Arago, and Sturgeon, and Henry,—to develop fully the twofold capacity of electro-magnetism.

To the natural inquiry why the very same announcement which—made at the beginning of the century—fell as it were "still-born," should when again made eighteen years later, have sprung into so exuberant and active a vitality, the answer seems to be,—first, the greater care taken by Oersted, the later husbandman, to scatter the seed broadcast over Europe;‡ and secondly, the riper condition of the intellectual soil, at the later Spring. Romagnosi's work would seem to have been prematurely attempted; while Oersted's, no more meritorious, had the good fortune to be taken up and fostered by still more scrutinizing coadjutors: and thus while the early sowing fell by the wayside or in stony places, the later sowing fell on good ground, well prepared; and there speedily followed at the hands of a diligent band of laborers an abundant and most precious harvest.

The question may possibly arise, could Oersted have probably had any intimation of Romagnosi's earlier cultivation of the same field? Considering how little the latter name is known among scientific men to-day, the question may be confidently answered in the negative. Dr. Hamel however has ventured the severe judgment: "I cannot forego stating my belief that Oersted knew of Romagnosi's discovery announced in 1802, which was eighteen years before the publication of his own observations. It was mentioned in Giovanni Aldini's (the nephew of Galvani's) book. . . . Oersted was in Paris in 1802, and 1803, and it appears from the book of Aldini, that at the time he finished it, Oersted was still in communication with him; for he

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Journal of the Society of Arts, April 23, 1858, vol. vi, p. 356.

†*Journal of the Society of Arts*, July 29, 1859, vol. vii, p. 605.

‡"Hans Christian Oersted, at Copenhagen, had directed the attention of the scientific world much more effectually than Romagnosi of Italy had done, to the fact that the magnetic needle deflects when a galvanic current comes near it." Dr. Hamel. (*Jour. Soc. Arts.* 1859, vol. vii, p. 606.)

says at the end (page 376), he had not been able to add the information received from Oersted, doctor of the University at Copenhagen, about the galvanic labors of scientific men in that country."*

All that is known of Oersted's simple, generous, and upright character, utterly repels any such dark suspicion: and the remarkable interval of eighteen years, which elapsed between the two dates of publication, negatives even the probability of plagiarism. It seems only wonderful that no other experimental physicist happened to hit upon the observation in all those years.†

In Sabine's treatise on the "Electric Telegraph," reference is made in a note to Izarn's "Manual of Galvanism" and to his statement of Romagnosi's early discovery :‡ and in the second edition (of its historical portion), published two years later, Sabine remarks: "The discovery of the power of a galvanic current to deflect a magnet needle, as well as to polarize an unmagnetized one, was known to and described as early as 1805 by Professor Izarn in his 'Manuel du Galvanisme.' . . . After explaining the way to prepare the apparatus, which consists in putting a freely suspended magnet needle parallel and close to a straight metallic conductor through which a galvanic current is circulating, he describes the effects in the following words: 'According to the observations of Romagnési, a physicist of Trent, a magnetic needle, being submitted to a galvanic current, undergoes a declination; and according to those of J. Mojon, a learned chemist of Genoa, unmagnetized needles acquire by this means a kind of magnetic polarity.' To Romagnési, physicist of Trent, therefore, and not as is generally believed, to Oersted, physicist of Copenhagen, (who first observed in 1820 the phenomenon of the deflection of a magnet needle by a voltaic current,) is due the credit of having made this important discovery."§

While this is undoubtedly a correct verdict, it remains none the less true that the rapid awakening of European physicists to the significance and importance of the principle of the galvanometer, was due entirely to its rediscovery and reannouncement by Professor Hans Christian Oersted in 1820.

NOTE C. (From p. 278.)

ANTICIPATIONS OF ELECTRO-MAGNETISM.

From the Treatises on Galvanism, by G. Aldini, published in 1804, and by J. Izarn, published in 1805, (previously noticed,) we learn that Giuseppi Mojon, (Joseph Moyon in the French,) a chemist of Genoa, on placing steel sewing-needles in connection with a galvanic battery observed that they became magnetic: (probably with transverse polarity.) The description is however very obscure. (Aldini, p. 191; Izarn, p. 120.)

"It deserves to be remembered," says Dr. Hamel, "that from Aldini's book it was known that the chemist Giuseppi Mojon, at Genoa, had before 1804 observed in unmagnetized needles exposed to the galvanic current, 'a sort of polarity'. Izarn repeats this also in his 'Manuel du Galvanisme;' which book was one of those that by order were to be placed in the library of every Lycée in France".‖

Still a quarter of a century earlier, in 1777, (now a century ago,) Giovanni Baptista Beccaria, a distinguished Italian natural philosopher, professor of experimental science at Turin, and author of several works on Electricity, in the course of his experiments

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*_Journal of the Society of Arts_, July 29, 1859, vol. vii, p. 606.

† "The invention all admired; and each how he
To be the inventor missed;—so easy seemed
Once found, which yet unfound, most would have thought
Impossible."

(Milton's _Par. Lost_, book vi.)

‡ _The Electric Telegraph_, by Robert Sabine, 8vo, London, 1867, part i, chap. iv, sec. 29, p. 22.

§ _History of the Electric Telegraph_, 2d edition (in Weale's Rudimentary Treatises), 1869, chap. iv, sec. 27, pp. 23, 24.

‖ _Journal of the Society of Arts_, 1859, vol. vii, p. 606.

"found that a needle through which he had sent an electric shock had in consequence acquired a curious species of polarity; for instead of turning as usual to the north and south, it assumed a position at right angles to this, its two ends pointing to the east and west."* This curious phenomenon (which if properly investigated might have led to the discovery of electro-magnetism) was exhibited by the action of common frictional or mechanical electricity: galvanism not having been discovered till some time later. It was probably this same transverse polarity that was afterward observed by Mojon.

NOTE D. (From p. 287.)

HENRY'S SPOOL MAGNET IN EUROPE.

Among the physicists of Europe who repeated Henry's experiments on a similar scale, Claude S. M. Pouillet, professor of physics at the *École Polytechnique* and director of the *Conservatoire* at Paris, made in 1832, a magnet capable of sustaining 900 pounds. At the session of the *Société Philomatique* of Paris, for June 23, 1832, Pouillet gave an account of recent experiments made by him with an electro-magnet of large size, having several thousand feet of wire wound upon it. The following is the report of this communication published in the "Bulletin" of the Society for August of that year:

"M. Pouillet communicated to the Society the results of experiments which he had just made on the magnetization of round bars of iron, (bent in horseshoe form, and surrounded on the arms with iron wire of a length of several thousand feet,) by means of an electric current established in this iron wire. The magnetism thus excited in a magnet one foot in height, formed of a bar of iron two and a half inches in diameter, and wrapped with 4,000 feet of wire, is sufficiently strong to support a weight up to 900 pounds, even when the contact of the armature with the magnet is reduced to an edge: so that the magnetic force is in this case stronger than the molecular attraction.† Attending such magnetization, on a connection being made between the two extremities of the conducting wire, a spark and a strong shock are produced. In another experiment, two similar magnets similarly arranged, having been placed facing each other, and varied in distance from contact up to a separation of a foot, the magnetization of the one produced a magnetization of the other by induction; so as to effect an electric current and spark when the two extremities of the conducting wire were brought very close together. In the latter case there was felt also a vivid shock. This shock may be communicated through a platinum wire even to the distance of a hundred feet."‡

The source of this "intensity" magnet is as unmistakable as is that of the magneto-electric spark obtained by its means. Had the experimenter however divided his 4,000 feet of wire into 50 or 60 separate coils, arranging suitably his galvanic battery in "multiple arc" as a "quantity" battery, he would certainly have greatly increased the attractive force of his magnet, and rendered it comparable to Henry's Yale-College magnet in lifting-power.

Pouillet in the third edition of his *Eléments de Physique Experimentale*, published in 1837, gives a drawing of a double "intensity" magnet arranged like Henry's in a supporting frame, of which he says: "Figures 432 and 433 represent an electro-magnet

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*P. M. Roget, Treatise on *Electro-magnetism*, 1832, chap. i, art. 6, p. 3. (This treatise is included in the "Library of Useful Knowledge," vol. ii.)

†[Notwithstanding the considerable range of distance through which magnetism acts, it is not probable that the aggregate magnetic tenacity of iron in any case amounts to more than a very small fraction of its cohesive tenacity.]

‡*Seance* of 23d June, 1832. *Nouveau Bulletin des Sciences*, publié par la "Société Philomatique de Paris," livraison pour Août, 1832, p. 127. This brief notice, republished in Quetelet's *Correspondance Mathematique et Physique* de l'Observatoire de Bruxelles, 1832, liv. v, vol. vii, pp. 317, 318, is the only paper by Pouillet on the subject of magnetization by electric currents, contained in the Catalogue of the Royal Society. Presumably therefore his only contribution on the subject.

which I constructed in 1831; and which easily supports nearly one ton (more than a thousand kilogrammes) when submitted to the current of a strong battery of 24 pairs. It consists of two horse-shoes opposed to each other, formed of round bars from three to four inches (8 to 10 centimetres) in diameter, and from two to two and a half feet (60 to 80 centimetres) in total length. The two arms of each horse-shoe are enveloped with about 1,100 yards (one thousand metres) of copper wire 26 thousandths of an inch (two-thirds of a millimetre) in thickness. The same current traverses successively the 2,200 yards (two thousand metres) of wire; but the helices are so disposed as to bring their opposite poles together." And the author repeats that as soon as the current is established, the lower free magnet is attracted to the upper fixed magnet with such force as to lift "an enormous weight, often exceeding a thousand kilogrammes."*

The remark just made applies equally to this example of the Henry "intensity" magnet, that by the substitution of the multiple coil and the "quantity" battery, it should have equalled the Henry Yale-College magnet, if not his Princeton magnet.

There is however in this latter account, an evident error of date, which should be noted. The differences of detail (in every particular) between the two magnets referred to, preclude any suggestion of the latter being an inaccurately remembered account of the former. The systematic excess of the latter magnet in every element of construction and performance equally excludes the possibility of its having been devised by its author prior to his notice before the "Société Philomatique" (on the 23d of June, 1832) of his success in developing a magnetic power of 900 pounds. And the fact that Pouillet, in the *second* edition of his Elements of Experimental Physics published in 1832 ("revue, corrigée et augmentée"), makes no allusion whatever to such a magnet, may be taken as conclusive evidence that no such magnet (nor any other) was constructed by him in 1831.†

The error of statement, in his third edition of the Elements of Physics is easily explained as a simple inadvertence in trusting to memory for a precise date.‡

It may be accepted with tolerable certainty that Pouillet's later and larger magnet could not have been made earlier than the latter part of 1832. And yet this inadvertent antedating by one year (wholly unimportant though it be) has been very precisely reproduced in the fourth edition of Pouillet's Physics, published in 1844, in the fifth edition published in 1847, in the sixth edition published in 1853, in the seventh edition published in 1856, and presumably in every subsequent edition, as well as in the numerous translations of this popular work. The earliest date of publication of Pouillet's 900-pound magnet is August, 1832; of his second, or 2200-pound magnet, is 1837.

NOTE E. (From p. 289.)

HENRY'S EARLY TELEGRAPHIC EXPERIMENTS.

The following are some of the testimonials of living eye-witnesses to the operation of Henry's early electro-magnetic telegraph, during the years 1831 and 1832.

The Hon. Alexander W. Bradford, a former pupil of the Albany Academy under Henry's professorship in 1831, and who left the academy in 1832, thus recalls his academic experiences, a third of a century later: "And there was another professor, whose life has been spared, who rose with the sun to instruct his pupil eager after knowledge; who giving his heart and soul to the duties of the school, had yet time for exploring

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* *Eléments de Physique Experimentale*, etc. par M. Pouillet, third edition, 2 vols. 8vo. Paris, 1837, liv. iii, sec. iv, chap. 5, art. 277. Vol. i, p. 572.

† *Eléments de Physique Experimentale*, etc. par M. Pouillet, second edition, 4 vols. 8vo. Paris, 1832.

‡ As if to magnify this accidental error, Dr. Lardner, in a popular text-book on the telegraph, makes the off-hand statement: "In 1830, an electro-magnet of extraordinary power was constructed under the superintendence of M. Pouillet at Paris. . . . With a current of moderate intensity the apparatus is capable of supporting a weight of *several tons*." (Lardner and Bright's *Electric Telegraph*, 12mo., London, 1867, chap. ii, sec. 39, p. 22.)

the deep paths of science; who with his wires and silk thread winding miles of insulated copper in the commencement hall of the academy, patiently toiled his way to the demonstration of the magnetic power of the galvanic battery; and years before the invention of the telegraph, proclaimed to America and to Europe the means of communication by the electric fluid. I was an eye-witness to those experiments and to their eventual demonstration and triumph. In this commemorative festival, let us not forget to honor the name of Joseph Henry." *

On the same interesting occasion Dr. Orlando Meads thus recounted Henry's early triumph: "The older students of the academy in the years 1830, 1831, and 1832, and others who witnessed his experiments, which at that time excited so much interest in this city, will remember the long coils of wire which ran circuit upon circuit for more than a mile in length around one of the upper rooms in the academy, for the purpose of illustrating the fact that a galvanic current could be transmitted through its whole length so as to excite a magnet at the farther end of the line, and thus move a steel bar which struck a bell. This in a scientific point of view, was the demonstration and accomplishment of all that was required for the magnetic telegraph. The science of the telegraph was here complete. It needed only the inventive genius of Morse to supply the admirable instrument which was to make it available for practical use. . . . All honor to the inventor; but let us not forget that the click of the telegraph which is heard from every joint of those mystic wires which now link together every city, and village, and post, and camp, and station, all over this continent, is but the echo of that little bell which first sounded in that upper room of the academy. These facts are a part of the history of the academy; and it is fitting that on an occasion like this, so important a discovery made by one of her own sons, in her service, and under her own roof, should not be passed over in silence." †

Professor James Hall (in the same year in which he was president of the American Association, at its Albany meeting) addressed a letter to Professor Henry, dated January 19, 1856, reciting the following reminiscence:

"While a student of the Rensselaer School in Troy (New York), in August, 1832, I visited Albany with a friend, having a letter of introduction to you from Professor Eaton. Our principal object was to see your electro-magnetic apparatus, of which we had heard much, and at the same time the library and collections of the Albany Institute. You showed us your laboratory in a lower story or basement of the building, and in a larger room in an upper story, some electric and galvanic apparatus, with various philosophical instruments. In this room and extending around the same, was a circuit of wire stretched along the wall, and at one termination of this in the recess of a window a bell was fixed, while the other extremity was connected with a galvanic apparatus. You showed us the manner in which the bell could be made to ring by a current of electricity transmitted through this wire; and you remarked that this method might be adopted for giving signals by the ringing of a bell at the distance of many miles from the point of its connection with the galvanic apparatus. All the circumstances attending this visit to Albany are fresh in my recollection; and during the past years while so much has been said respecting the invention of electric telegraphs, I have often had occasion to mention the exhibition of your electric telegraph in the Albany Academy in 1832." ‡

On the occasion of a visit by Henry to the Albany Institute, about two years later than the date of the above letter, Professor Hall made public reference to the same vivid recollections. At a meeting of the Albany Institute, held Januay 13, 1858, in a hall of the Albany Academy building, "Professor Hall called attention to the fact, in connection with the visit of Professor Henry, that in 1832 he had witnessed in this

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* "Commemorative Address," on the celebration of the semi-centennial anniversary of the Albany Academy, June 23, 1863. *Proceedings*, etc. p. 48.

† "Historical Discourse", at semi-centennial anniversary of Albany Academy, June 23, 1863. *Proceedings*, etc. pp. 25, 26.

‡ Published in the *Smithsonian Report* for 1857, p. 96.

building illustrations by Professor Henry of his results in electro-magnetism. He saw here a wire of great length, through which Professor Henry transmitted a current of galvanic electricity, and made the current to exert its power in ringing a bell at the extremity of the wire. This was certainly the first establishment of the practicability of the magnetic telegraph."

"Professor Henry stated that he felt gratified at this public recognition of his early labors and discoveries in reference to the electric telegraph." *

Henry's primitive electro-magnetic telegraph (as already stated) was properly an *acoustic* telegraph. Morse's subsequent electro-magnetic telegraph was a *recording* telegraph, and it was this feature of automatic register which was always regarded by its inventor as the most characteristic and important element of his invention. "It was soon discovered, after the introduction of the Morse system of telegraph, that words could be read by the click of the magnet; but paper was used upon which the arbitrary alphabet of dots and lines was indented by the instruments, for all matters of business up to 1852, and by many lines even later; but at the present time there is scarcely an office of any importance in the United States where the paper is used to receive the record. Ten years ago the practice was almost invariable in the principal offices to employ an operator to read the dispatch from the long strips of paper as it came from the instrument; and a copyist who stood by his side took it down. Now the system is entirely changed. The operator reads by the click, and copies the message himself. By this means the expense is lessened nearly one-half, and the risk of errors in a far greater ratio."† To which it may be added, that the diminished duty of the armature enables a single circuit to be operated through double the distance practicable with the Morse recorder.

And thus it has come to pass that the Morse telegraph to-day, is (by reversion to a more primitive type) essentially an *acoustic telegraph*.‡ So that "the click of the telegraph heard all over this continent," is in Dr. Meads's expressive phrase, *functionally and in truth* "but the echo of that little bell which first sounded in that upper room of the Albany Academy."

NOTE F. (From p. 296.)

HENRY'S RELATION TO THE ENGLISH TELEGRAPH.

In consequence of the repeated disagreements between the English patentees, Messrs. Cooke and Wheatstone, (not long after their procurement of a joint patent in June, 1837,) as to their respective shares of originality and credit in the invention of the needle telegraph, "Articles of Agreement" were drawn up on the 16th of November, 1840, for the submission of their grounds of claim and of dissatisfaction, to the arbitrament of two referees, Marc Isambard Brunel, on the part of Mr. Cooke, and John Frederick Daniell, on the part of Mr. Wheatstone. And in December of 1840, the

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* *Trans. of Albany Institute*, vol. iv, "Proceedings," p. 245.

† Prescott's *History of Electric Telegraph*, Boston, 1860, chap. v, pp. 92–93. To the same effect is the statement in his later work: "In the larger telegraph offices of the United States and Canada, the recording instrument, or register, is entirely dispensed with, and all communications are read by the sound made by the armature lever as it vibrates between the upper and lower stops." (Prescott's *Electricity and the Electric Telegraph*, New York, 1877, chap. xxx, p. 435.)

‡ Numerous patents have been granted for "sounders," having for their object the emphasizing or re-enforcement of the sound from the receiving key or armature impacts. Prescott, in his recent work, speaking of Thomson's ingenious and extremely delicate "siphon recorder," remarks: "It is somewhat curious that in the progress of telegraphic improvement, Morse's telegraph (the most valuable feature of which originally was considered to be its capacity for recording communications) should have been modified in practice into an acoustic semaphore, while Cooke's telegraph (originally a semaphore) should at length have been also modified into a recording instrument." (*Electricity and the Electric Telegraph*, chap. xxxii, p. 561.)

contestants presented to the said arbitrators the carefully prepared statements of their respective "cases."*

Mr. Cooke, in his "Statement of Facts to the Arbitrators," gave the following account of his telegraphic failure in February, 1837, which was precisely that encountered and announced by Barlow, some dozen years before: "I employed myself in trying experiments upon the electro-magnet, with a view to discover at what distance an electric current would excite the temporary magnetism required for moving the detent of the mechanism. For this purpose I adjusted above a mile of wire in the chambers of Mr. Lane, in Lincoln's Inn; *but the magnets and battery being ill proportioned*, my experiments were unsatisfactory."† The cause of failure stated, evidently represents his acquired knowledge in 1840, not that in 1837. It was the singular fatality of electro-magnetism confronting every early experimenter from Barlow downward, that whether the number of cells in the battery were increased, or whether the length of wire coiled around the magnet were extended, the effect upon the magnet in either case *rapidly diminished* after a certain short distance of circuit. Who then would think for a moment of compounding these enfeebling arrangements?

In the desperate emergency which seemed to impose an impassable barrier to his signal device, Mr. Cooke consulted successively three among the most eminent of British electricians: Professor Faraday, Dr. Roget, and Professor Wheatstone. The following is the continuation of his own account, from the "case" already quoted: "In this scientific difficulty I sought the assistance of Dr. Faraday, who advised me to increase the number of the plates of the battery proportionably to the length of the wires; an expedient which in some degree overcame the defect of the magnet.‡ I also consulted Dr. Roget upon the same scientific point. . . . Dr. Roget informed me that Professor Wheatstone had a quantity of wire at King's College, which might assist me in trying experiments upon the electro-magnet, and he advised me on that account to submit my difficulty to him." To the same effect, in his later pamphlet published in March, 1856, (more than fifteen years afterward,) he said: "This result was to be accomplished by means of an electro-magnet; and it was my inability to make the electro-magnet act at long distances which first led me to Mr. Wheatstone."§

At this point it is proper to turn to Professor Wheatstone's statement of the interview, in his own "case," as presented to the arbitrators at the same time, in December, 1840:

"I believe but am not quite sure that it was on the first of March, 1837, that Mr. Cooke introduced himself to me. He told me that he had applied to Dr. Faraday and Dr. Roget for some information relative to a subject on which he was engaged, and that they had referred him to me as having the means of answering his inquiries. . . . Relying on my former experience, I at once told Mr. Cooke that it would not and could not act as a telegraph, because sufficient attractive power could not be imparted to an electro-magnet interposed in a long circuit; and to convince him of the truth of this assertion, I invited him to King's College to see the repetition of the experiments on which my conclusion was founded. He came, and after seeing a variety of voltaic

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* These documents, with the "award" rendered April 27, 1841, published immediately afterward, were some years later republished by Mr. Cooke (together with subsequent controversial pamphlets between the parties) in two octavo volumes, under the common title, "The Electric Telegraph: was it invented by Professor Wheatstone?" One volume, published in 1856, comprising the "Arbitration Papers" in full, is injudiciously designated "Part II." The other volume, published in 1857, embracing matter of a much later date, is improperly designated "Part I." This part comprises a reprint of "Mr. Cooke's First Pamphlet," published in December, 1854; of "Mr. Wheatstone's Answer," published in January, 1856; and of "Mr. Cooke's Reply," published in March, 1856.

† *The Electric Telegraph*, etc. by W. F. Cooke, part ii, sec. 46, p. 24.

‡ Faraday in his brilliant series of researches commencing in September, 1831, employed almost exclusively Henry's "quantity" magnet of numerous short coils; and hence naturally paid little attention to the feebler energies of Henry's "intensity" magnet.

§ Work above quoted, part i, pp. 198, 199.

magnets, which even with powerful batteries exhibited only slight adhesive attraction, he expressed his disappointment."*——"When I endeavored to ascertain how a bell might be more efficiently rung, the attractive power obtained by temporarily magnetizing soft iron first suggested itself to me. The experiments I made with the long circuit at King's College however led me to conclude that the attraction of a piece of iron by an electro-magnet could not be made available in circuits of very great length, and therefore I had no hopes of being able to discharge an alarum by this means."†

Not a little surprising is it that three savans so distinguished, all of them familiar in a general way with Henry's electro-magnetic researches published more than six years before, should each have failed to apprehend, or should have forgotten, the distinctly declared virtue of his "intensity" magnet.‡ Henry, in 1829, and 1830, had fully demonstrated that while with a single galvanic pair a small magnet surrounded with a long wire showed very feeble magnetism (as compared with one of short coil), with a "trough" battery of many pairs it exerted a stronger attraction after the current had passed through 1,060 feet of wire in the circuit than when the coil was directly connected with the battery. He had announced: "From these experiments it is evident that in forming the coil we may either *use one very long wire* or several shorter ones, as the circumstances may require; in the first case our galvanic combination *must consist of a number of plates*, in the second it must be formed of a single pair." And he had expressly called attention to the fact that the former arrangement "is directly applicable to the project of forming an electro-magnetic telegraph."§

Mr. Cooke continued the narrative in his "case" as follows: "On many occasions during the months of March and April, 1837, we tried experiments together upon the electro-magnet; our object being to make it act efficiently at long distances in its office of removing the detent. The result of our experiments confirmed my apprehension that I was still without the power of exciting magnetism at long distances. . . . In this difficulty we adopted the expedient of a secondary circuit, which was used for some time in connection with my alarum."‖

It is at this period that Henry made his first visit to England; and in London he formed an acquaintance with Faraday, with Roget, and with Wheatstone, with each of whom he had many pleasant and familiar interviews, and for each of whom he ever entertained a warm personal regard. He has left the following account of his communication with the professor last named:

"In February, 1837, I went to Europe; and early in April of that year, Professor Wheatstone, of London, (in the course of a visit by myself to him in King's College, London, with Professor Bache, now of the Coast Survey,) explained to us his plans of an electro-magnetic telegraph; and among other things exhibited to us his method of bringing into action a second galvanic circuit. This consisted in closing the second circuit by the deflection of a needle so placed that the two upward projecting ends of the open circuit would be united by the contact of the end of the needle when deflected; and on opening or breaking the circuit so closed, by opening the first circuit and thus interrupting the current, the needle would resume its ordinary position under the influence of the magnetism of the earth. I informed him that I had devised another method of producing effects somewhat similar. This consisted in

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* ["Electro-magnets of the greatest power, even when the most energetic batteries are employed, utterly cease to act when they are connected by considerable lengths of wire with the battery." (*Introduction to the Study of Chemical Philosophy:* by Prof. John Frederick Daniell, 2d ed. 1843, chap. xvi, sec. 859, p. 576.)]

† *The Electric Telegraph*, etc. by W. F. Cooke, part ii, sects. 268, 272, and 299, pp. 86, 87, and 93.

‡ Faraday refers to Henry's magnets in his *Experimental Researches*, etc. (Nov. 24, 1831), vol. i, art. 57, p. 15; and Roget refers to them in his excellent Treatise on *Electro-Magnetism*, 8vo. London, 1832, chap. x, sec. 161, p. 55.

§ Silliman's *American Journal of Science*, January, 1831, vol. xix, p. 404.

‖ *The Electric Telegraph*, etc. by W. F. Cooke, part ii, sec. 51, p. 27.

opening the circuit of my large quantity magnet at Princeton, when loaded with many hundred pounds weight, by attracting upward a small piece of movable wire with a small intensity magnet connected with a long wire circuit. When the circuit of the large battery was thus broken by an action from a distance the weights would fall; and great mechanical effect could thus be produced, such as the ringing of church-bells at a distance of a hundred miles or more,—an illustration of which I had previously given to my class at Princeton. . . . The object of Professor Wheatstone as I understood it, in bringing into action a second circuit, was to provide a remedy for the diminution of force in a long circuit. My object in the process described by me was to bring into operation a large quantity magnet connected with a quantity battery in a local circuit, by means of a small intensity magnet and an intensity battery at a distance." *

This important historic interchange of experiments and projects between Henry and Wheatstone, possesses an interest and a significance quite beyond that present in the contemplation of the writer. To Henry, the confidence imparted was striking only from the coincidence of separate inventions in the combination or conjunction of two circuits; in his own case by the agency of an "intensity" magnet at a distance, in the other case by the agency of a galvanometer needle at a distance.† But to Wheatstone, how different must have been the impression and suggestion! From the simple account of Henry's contrasted "intensity" and "quantity" magnets; of his telegraphic experiment in 1831,—the magnetic tapping of a bell through more than a mile of fine copper wire; of his daring faith in being able to ring heavy bells by a terminal "quantity" magnet, "*at a distance of a hundred miles or more!*" with what new interest and meaning must the earlier and neglected researches of Henry have been recalled. Who could doubt that with the unsolved problem of Mr. Cooke just fresh before him, with his active and fertile mind awakened, quick to seize upon and develop a new idea, (as well illustrated in his intercourse with Mr. Cooke,) who could doubt that the presentation above recorded (in *April* of 1837,) must have been to him a new solution and a sudden revelation?

Surely some recognition of Henry's published researches was to be looked for in return for the unexpected but unquestionable benefit conferred. We search in vain for any such requital or acknowledgment. In amplifying his own "improvements" before the arbitrators, he says: "*But the most important point of all* was my application of the theory of Ohm to telegraphic circuits, which enabled me to ascertain the best proportions between the length, thickness, &c., of the multiplying coils and the other resistances in the circuit, and to determine the number and size of the elements of the battery to produce the maximum effect. With this law and its applications, *no persons who had before occupied themselves with experiments relating to Electric Telegraphs had been acquainted*"!‡ The "theory of Ohm" (announced in 1827), had avowedly no influence whatever on Wheatstone's researches—till after his interview with Henry, in April, 1837; nor was the "theory of Ohm" any more definitely applied, or any more implicitly confirmed, by the later English experimenter in 1837, than it had been by the earlier American experimenter in 1829, and 1830. And Professor Wheatstone's explicit declarations that in *March*, 1837, he found by experience that "sufficient attractive power could *not* be

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* *Smithsonian Report* for 1857, pp. 111, 112. As Prof. Alexander Dallas Bache was present on the occasion above mentioned, and as he was also subsequently a Regent of the Institution, under whose direct supervision and authority the above statement of Henry was published by the board, it may be regarded as having his implicit corroboration.

† Professor Wheatstone, in his "Answer" to Mr. Cooke's Pamphlet, says: "My experiments led me to believe that the motions of a needle could be produced at distances at which no effects of electro-magnetic attraction could be obtained." (Letter of October 26, 1840; reprint, p. 114.)

‡ "Professor Wheatstone's Case." *The Electric Telegraph*, etc. by W. F. Cooke, part ii, sect. 290, p. 91.

imparted to an electro-magnet interposed *in a long circuit*,"—that "the attraction of a piece of iron by an electro-magnet could *not* be made available in circuits *of very great length*," excludes absolutely and forever, all possibility of competitive claim to a discovery admittedly "the most important point of all" in the practical development of a real *telegraph;—the discovery of the "intensity" magnet.* Undoubtedly required to institute especial experiments in order to properly proportion his magnet and battery, Wheatstone was led by self-esteem to entirely overestimate the originality of such experiments, and correspondingly to underrate the value of Henry's instructions or suggestions.

Recurring to his plan of a terminal secondary circuit Professor Wheatstone re-iterates in the same document: "Having convinced myself that it was hopeless to expect to ring an alarum by the direct action of the electric current through a circuit of great length on an electro-magnet as ordinarily constructed, I began to think whether the effect required might not be produced in an indirect manner. It occurred to me that the difficulty would be overcome if a short circuit in which the electro-magnet of the alarum and a rather powerful electro-motor should be interposed, could be com pleted and broken at will by some action governed by the current in the long circuit. . . . These methods of completing the secondary circuit have lost all their importance and are scarcely worth contending about, *since my discovery* that electro-magnets may be so constructed as to produce the required effects by means of the direct current, even in very long circuits."

Again returning to this fatal theme, he repeats (having resolved to "carry out his investigations alone" without the co-operation of Mr. Cooke), "After this resolution had been taken, I commenced a series of researches *on the laws of electro-magnets*, and was fortunate enough to discover the conditions (*which had not hitherto been made the subject of philosophical inquiry*) by which effects could be produced at great distances. This rendered electro-magnetic attraction *for the first time* applicable in an immediate manner to telegraphic purposes."*—Notwithstanding that Henry, in 1830, had demonstrated—and on the first of January, 1831, had confidently announced to the scientific world, that his own original "intensity" magnet with a "trough" battery, was "directly applicable to the project of forming an electro-magnetic telegraph"!

This redundant iteration of original discovery, this reticence as to any similar investigation known to have been even *attempted* by Henry, scarcely permits the charitable suggestion of "unconsciousness." That his persistent claim should have misled his colleague, Professor Daniell, into incorporating in the text of his new edition of the "Chemical Philosophy" the following laudation, is perhaps not altogether to be wondered at: "Ingenious as Professor Wheatstone's contrivances are, they would have been of no avail for telegraphic purposes without the investigation (*which he was the first to make*) of the laws of electro-magnets when acted on through great lengths of wire."† Were the name of Henry inserted in the italicised parenthesis, the proposition stated would be beyond the reach of cavil or exception. Ingenious as Professor Wheatstone's contrivances were, *they would have been of no avail* for telegraphic purposes, without the investigation (which HENRY was the first to make)—of the laws of electro-magnets when acted on through great lengths of wire.

Mr. Cooke (to whom probably even the existence of Henry was unknown) makes the very expressive comment on the above passage from the "Chemical Philosophy" of the professor at King's College: "Mr. Daniell might have added that this investi-

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* "Professor Wheatstone's Case," as above cited, sect. 306, 314, and 333, pp. 94, 96, and 100.

† *Introduction to the Study of Chemical Philosophy*, second edition, 1843, chap. xvi, sect. 859, p. 576.

gation had not been commenced or thought of in *March*, 1837!"* In this pamphlet controversy which occurred between the joint-patentees some fourteen years after the memorable "award," Professor Wheatstone in his "Answer" (of January, 1856,) to Mr. Cooke's first pamphlet (of December, 1854,) somewhat more feebly re-echoes: "With this law and its applications *no persons in* ENGLAND who had before occupied themselves with experiments relating to electric telegraphs had been acquainted."†

The substance of the "award" rendered by the distinguished arbitrators April 27, 1841, in the matter of the Cooke and Wheatstone controversy, was that "Mr. Cooke *is entitled to stand alone* as the gentleman to whom this country is indebted for having practically introduced and carried out the electric telegraph as a useful undertaking, promising to be a work of national importance: and Professor Wheatstone is acknowledged as the scientific man whose profound and successful researches have already *prepared the public to receive it* as a project capable of practical application."‡ This decision—studiously non-committal as is its language, and even as interpreted by the extra-judicial letter of Professor Daniell, dated March 24, 1843, (two years subsequently,) cannot be regarded as sustaining the prominent theory of "Professor Wheatstone's Case," assuming priority of suggestion or of application of the needle telegraph, as compared with Mr. Cooke.

NOTE G. (From p. 305.)

THE AUTHORSHIP OF THE "MORSE ALPHABET."

It appears from various concurring testimonies, that the new recording instrument constructed for Professor Morse by Mr. Vail during October, November, and December, 1837, was entirely of his own design, without any suggestions from Professor Morse; and that its arrangement for discontinuous marking was specially contrived by its maker for an alphabet exclusively devised by himself; which he abstained from publicly claiming, owing to a delicate sense of obligation incurred by his contract with Professor Morse, to render him every assistance in perfecting the mechanical arrangements of the telegraph.§

That Professor Morse had no conception on the 3d of October, 1837, of the form of instrument contemplated by Mr. Vail, is clearly shown by his autographic "caveat" of that date. And his letter to Mr. Vail, of October 24th, announcing the completion of the numbered dictionary, (in which he wrote "we can now talk or write anything by numbers,") is equally conclusive evidence that at this later date, he was still unconscious of any alphabetic improvement.

An article in the New York Sun, by its editor, Mr. Moses S. Beach, (written in 1858,) under the heading "Honor to whom honor is due," makes the statement, "We will mention a few incidents connected with Professor Morse's own experience, which we have never seen in print, and which lose none of their interest from the unassuming modesty of the parties referred to." And after alluding to the assistance furnished

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* Mr. Cooke's "Reply" to Professor Wheatstone's "Answer." (*The Electric Telegraph*, etc. by W. F. Cooke, part i, p. 199.) Dr. John Locke, of Cincinnati, who was in London in the summer of 1837, on his return to this country, having informed Professor Morse of Wheatstone's telegraphic experiments, Professor Morse in a letter from New York to Alfred Vail, at Speedwell, dated October 24, 1837, thus referred to the matter: "We have just heard that Professor Wheatstone has tried an experiment with his method, *twenty miles*, with success. We have therefore nothing to fear." (Prime's *Life of Morse*, chap. viii, p. 326.) At this date Professor Gale had operated the Morse instrument through only three miles of wire in the circuit.

† *The Electric Telegraph*, etc., by W. F. Cooke, part i, p. 57.

‡ *The Electric Telegraph*, etc., by W. F. Cooke, part i, p. 16: and part ii, pp. 214 and 268.

§ By the terms of the partnership in the telegraph, Mr. Vail agreed "to devote his personal services and skill in constructing and bringing to perfection, as also in improving, the mechanical parts of said invention, . . . without charge for such personal services to the other proprietors, and for their common benefit."

the inventor in his early imperfect experiments by the Messrs. Vail, the editor continues: "Alfred Vail entered into these experiments with his whole soul, and to him is Professor Morse indebted, quite as much as to his own wit, for his ultimate triumph. *He it was who invented the far-famed alphabet;* and he too was the inventor of the instrument which bears Morse's name. But whatever he did or contrived, went cheerfully to the great end. Alfred felt rewarded in seeing the gradual accomplishment of the dream."*

In an interesting article entitled "The first week of the Telegraph," written in 1869 for a New York monthly magazine, by Dr. William P. Vail, the following significant allusion to his deceased nephew, Mr. Alfred Vail, occurs: "The birth-time and the birth-place of the telegraph as a recording instrument of *intelligence*, . . . the parties who wrought the rude original plan into working order and gave it efficiency, the man *who invented the 'Morse alphabet'* (so called), and to whose ingenuity, mechanical skill, and tireless perseverance, the clock-work of the telegraph machine is largely due, . . . all this is well understood, and for the most part is written down, and the record some day in the near future must find its place in history, upon the true principle of *suum cuique.*"†

It is noteworthy that neither the published statement made by the editor of the "Sun," nor that made by Mr. Vail's uncle in the "Hours at Home," (both widely circulated, and copied into other journals during Professor Morse's life-time,) was ever called in question by the celebrated telegrapher. His painful silence under the circumstances is not easily defensible.

Mr. Francis O. J. Smith, one of the partners in the original telegraph patent of Morse, (having had as capitalist and business manager, a one-fourth interest in the enterprise,) has also stated in a published letter, dated March 30, 1872, (not long before Professor Morse's death,) that the modified horizontal lever adapted "to emboss the alphabetic characters," was "neither invented nor combined in the telegraph by Professor Morse, but exclusively by our associate—Mr. Alfred Vail; although for reasons that will be satisfactory to most minds, they were never publicly credited to him, but have been claimed exclusively by Professor Morse as his own invented combination."‡

Dr. Gale, the only surviving member of the original partnership, states in a recent letter on the subject, that he does not distinctly remember whether the changed arrangement of the lever to a horizontal position in the new model constructed by Mr. Vail, was his exclusive invention or not.

In a biographical sketch of Alfred Vail by Mr. Frederick Brent Read, of Cincinnati, published in 1873, the writer states without qualification: "Alfred Vail first produced in the new instrument the first available *Morse* machine. He invented the first combination of the horizontal lever motion to actuate a pen or pencil or style, and the entirely new telegraphic alphabet of dots, spaces, and marks, which it necessitated; and he did so prior to September, 1837, the month when the old instrument passed into his hands for reconstruction. . . . The new machine was Vail's, not Morse's.

**New York Sun*, for September 25, 1858. Republished in the *Weekly Sun*, for October 2, 1858. In a recent letter on the subject, Mr. M. S. Beach, the author of the above, states: "I was then personally acquainted with the Vails, and a not unfrequent visitor at the homestead in Morristown; besides of course having a personal acquaintance with Professor Morse, and with the telegraph managers generally. My impression is that the article was at the time approved for its exact statement—*never controverted.*"

†Scribner's *Hours at Home*, September, 1869, vol. ix, pp. 435, 436. In response to an inquiry as to the evidence of Mr. A. Vail's invention of the "dot-and-dash" alphabet, Dr. W. P. Vail, the author of the above, declares in a recent letter, "It was so understood by all who were admitted to his intimacy. In a conversation with him shortly before his death, in 1859, he so assured me. I am not aware that Mr. Morse ever set up an adverse claim."

‡A pamphlet entitled "*History Getting Right* on the invention of the American Electro-magnetic Telegraph," 1872, p. 21. It does not appear that Professor Morse ever did explicitly claim these inventions as his own.

The claim is clearly made then, that Alfred Vail in the first place invented an entirely new alphabet; secondly, he invented an entirely new machine in which was the first combination of the horizontal lever motion to actuate a pen or pencil or style, so arranged as to perform the new duties required with precision, simplicity, and rapidity; and thirdly, Vail invented, several years afterward [in 1844], the new lever and [grooved] roller which embossed into paper the wholly simple and perfect alphabetic characters which he alone originated."*

Numerous experiments with various kinds of pencils, fountain-pens, and inked roulettes, having shown their inefficiency for the uniform marking of the "dot-and-dash" alphabet, Alfred Vail at last boldly discarded all marking devices, and employed a blunt steel point near the end of the registering lever, playing directly over a narrow groove in the roller which supported the record-fillet of paper. In this manner the variable lines of the Vail alphabet were permanently indented in the paper with perfect facility and unerring regularity. Mr. F. B. Read in his biographical sketch of Samuel F. B. Morse (in the work just quoted), after alluding to his original apparatus as being placed by him " in Mr. Vail's hands for an entire mechanical reconstruction throughout, to speak a language not only wholly unknown to the first machine, but to perform entirely new functions, and to produce an entirely new system of signs and letters which the first by its structure was physically incapable of being made to speak;" adds with regard to Mr. Vail's subsequent improvement, "His more perfect invention of a steel style upon a lever which could strike into the paper as it was drawn onward over a grooved roller and *emboss* upon it the same alphabetic characters, was not made until 1844, about the time the first line of telegraph began to operate between Baltimore and Washington."†

Simple as may appear the substitution of the dry point for the inked wheel or pen, its introduction effected a wonderful saving of time, of attention, and of annoyance. In a memorandum attached to the original model of the lever-style and grooved roller, Alfred Vail wrote, "I have not asserted publicly my right as first and sole inventor, because I wished to preserve the peaceful unity of the invention, and because I could not according to my contract with Professor Morse, have got a patent for it."‡

Mr. Read, in the same biography of Morse, after quoting his feeble and insufficient tribute to Vail, in his speech at the banquet given at New York on the evening of December 29, 1868, in honor of the "successful" inventor, (in which he said of his intellectual offspring, "It found a friend in Mr. Alfred Vail, of New Jersey, who with his father and brother *furnished the means* to give the child a decent dress;") makes the comment, "It would have been more magnanimous if in those last days of the aged savant he had stated the precise facts, and given Alfred Vail the full credit to which he was justly entitled. He would thus have generously raised a fitting monument to the memory of one who had years before 'been gathered to his fathers' in the prime of manhood, who had with wondrous modesty and singular reticence refrained from claiming as of his own invention, the improved 'Morse' instrument and alphabet." §

In again referring to this subject in his following sketch of the life of Vail, the author adds, "These are the quiet and subdued terms in which Professor Morse was content to hand his co-inventor and early friend down to posterity. He makes no allusion to Alfred Vail which would lead any one to suspect that he was anything more than a skillful mechanic;—that Vail had ever done anything beyond putting into form the conception of Morse's brain. To say the least, it was an unhappy holding off from a magnanimous and generous course."‖

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*A collection of biographical notices, entitled *Up the Heights of Fame and Fortune*, by F. B. Read, 8vo. Cincinnati, 1873, pp. 270, 271. Thirty-four pages are devoted to an account of the life of Alfred Vail; who died at Morristown, January 18, 1859.

† *Up the Heights of Fame and Fortune*, pp. 244, 245.

‡ Quoted in same work: p. 291. § Same work: p. 244.

‖ Same work: p. 297. A friend of Mr. Vail, (unnamed,) who visited Professor Morse at his request during his last illness in March, 1872, is reported as stating, "In

At a meeting of the Directors of the "Magnetic Telegraph Company" held at Philadelphia on the 16th of February, 1859, for the purpose of giving expression to their feelings on the recent death of Alfred Vail (a brother Director), Amos Kendall in seconding and warmly supporting the offered resolutions of respect and grief, is thus reported: "In the words of the distinguished associate and friend of both, the Hon. Amos Kendall, 'If justice be done, the name of Alfred Vail will forever stand associated with that of Samuel F. B. Morse, in the history of the invention and introduction into public use, of the Electro-magnetic Telegraph. . . . Mr. Vail was one of the most honest and scrupulously conscientious men with whom it has ever been my fortune to meet.'"*

Surely it is time that Alfred Vail should receive the tardy justice of some public acknowledgment of his very ingenious and meritorious inventions in telegraphy, and of grateful remembrance particularly for his valuable contribution to the "Morse system" of its practically most important element.

NOTE H. (From p. 317.)

AN UNWARRANTED ARRAIGNMENT.

Henry, elected December 3, 1846, to the position of "Secretary" and Director of the Smithsonian Institution, was for ten years engaged in a difficult but resolute struggle to impress upon its administration his own sagacious and far-sighted policy; at that time but little appreciated by the vast majority of those who wielded political or literary influence. It was during the latter portion of this critical period, while still almost entirely abstracted from his favorite pursuits, that he was made the subject of a most wanton, unprovoked, and unlooked-for aspersion. In this ill-advised attack—elaborately prepared either by or for Professor Morse, more than a year before its wide-spread publication,† the pamphleteer not only boldly assailed the scientific reputation of the great experimental physicist, but ventured (for the first time in the latter's career) to impugn his *truthfulness*, in an important testimony given in certain telegraph suits, some half a dozen years previously, in reluctant obedience to legal summons.‡ This testimony thus exacted, of course failed to sustain the complainant's exorbitant claims to all possible forms of the electro-magnetic telegraph, and correspondingly failed to satisfy the cupidity of the actual prosecutors; and in this remarkable accusation, first published in 1855, could readily be discerned the mercenary inspiration of interested capitalists and assignees—anxious only to stretch the monopoly to its extremest grasp. To Professor Morse himself, in his early efforts, Henry had generously rendered every encouragement and assistance; and in

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a conversation of two hours, he several times said, 'The one thing I want to do now, is justice to Mr. Vail.' . . . Just four weeks from that day, he passed from earth; and I have never heard that he left one word for it. Indeed, I did not expect that he would." To this statement, Mr. Read adds, "Here we leave Professor Morse and his relations to Alfred Vail. Our only purpose has been simply to bring the facts concerning this wonderful invention, to the light of day. (Same page of the work: — p. 297.)

* Same work: p. 296.

† Professor Morse's signature upon the last page of the Impeachment (p. 96), is dated December, 1853. The pamphlet was published January, 1855.

‡ The Hon. S. P. Chase, while Governor of Ohio, (subsequently Chief Justice of the Supreme Court of the United States,) in a letter to Henry, dated Columbus, November 26, 1856, after reciting his professional connection with the litigations of 1849, says: "I remember very well that you were unwilling to be involved in the controversy even as a witness, and that you only submitted to be examined in compliance with the requirements of law. Not one of your statements was volunteered; they were all called out by questions propounded either verbally or in writing. . . . You could not have refused to respond to the questions propounded without subjecting yourself to judicial animadversion and constraint. Nothing in what you testified, or your manner of testifying, suggested to me the idea that you were animated by any desire to arrogate undue merit to yourself, or to detract from the just claims of Professor Morse."

his later successes had as freely extended his congratulations and his testimonials of the practical merits of his invention.*

To descend to a personal controversy with Mr. Morse, was utterly repugnant to Henry's feelings; to permit his serious impeachment to stand untraversed, appeared scarcely less objectionable. With a calm and self-respecting dignity, Henry simply presented the published arraignment to the Board of Regents, for their consideration and action, with a communication dated March 16, 1857, in the following terms:

"GENTLEMEN: In the discharge of the important and responsible duties which devolve upon me as Secretary of the Smithsonian Institution, I have found myself exposed, like other men in public positions, to unprovoked attack and injurious misrepresentation. Many instances of this it may be remembered occurred about two years ago, during the discussions relative to the organic policy of the Institution; but though very unjust, they were suffered to pass unnoticed, and generally made I presume no lasting impression on the public mind. During the same controversy however there was one attack made upon me of such a nature, so elaborately prepared and widely circulated by my opponents, that though I have not yet publicly noticed it, I have from the first thought it my duty not to allow it to go unanswered. I allude to an article from the pen of Prof. S. F. B. Morse, the celebrated inventor of the American electro-magnetic telegraph. In this, not my scientific reputation merely, but my moral character was pointedly assailed; indeed, nothing less was attempted than to prove that in the testimony which I had given in a case where I was at most but a reluctant witness, I had consciously and willfully deviated from the truth, and this too from unworthy and dishonorable motives.

"Such a charge, coming from such a quarter, appeared to me then, as it appears now, of too grave a character and too serious a consequence to be withheld from the notice of the Board of Regents. I therefore presented the matter unofficially to the Chancellor of the Institution, Chief Justice Taney, and was advised by him to allow the matter to rest until the then existing excitement with respect to the organization of the Institution should subside; . . . and I now embrace the first opportunity of bringing the subject officially to your notice, and asking from you an investigation into the justice of the charges alleged against me. And this I do most earnestly, with the desire that when we shall all have passed from this stage of being, no imputation of having attempted to evade in silence so grave a charge shall rest on *me*,—nor on *you*, of having continued to devolve upon me duties of the highest responsibility, after that was known to some of you individually, which if true should render me entirely unworthy of your confidence. Duty to the Board of Regents, as well as regard to my own memory, to my family, and to the truth of history, demands that I should lay this matter before you, and place in your hands the documents necessary to establish the veracity of my testimony so falsely impeached, and the integrity of my motives so wantonly assailed."†

A select committee of the Board of Regents having accordingly been appointed to examine fully into the imputations referred to, and thereupon to report the conclusion reached,—after a careful consideration of all the evidence and documents accessible, presented through its chairman, President Felton, of Harvard University, a comprehensive report, from which the following extracts are made:

"The committee have carefully examined the documents relating to the subject, and especially the article to which the communication of Professor Henry refers. This article occupies over ninety pages, and purports to be 'a defense against the injurious

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* "It was my wish in every statement to render Mr. Morse full and scrupulous justice. While I was constrained therefore to state that he had made no discoveries in science, I distinctly declared that he was entitled to the merit of combining and applying the discoveries of others in the invention of the best practical form of the magnetic telegraph. My testimony tended to establish the fact that though not entitled to the exclusive use of the electro-magnet for telegraphic purposes, he was entitled to his particular machine, register, alphabet, &c. This however did not meet the full requirements of Mr. Morse's comprehensive claim."

† *Smithsonian Report* for 1857, pp. 85, 86.

deductions drawn from the deposition of Prof. Joseph Henry (in the several telegraph suits), with a critical review of said deposition, and an examination of Professor Henry's alleged discoveries bearing upon the electro-magnetic telegraph.' The first thing which strikes the reader of this article is, that its title is a misnomer. It is simply an assault upon Professor Henry; an attempt to disparage his character; to deprive him of his honors as a scientific discoverer; to impeach his credibility as a witness, and his integrity as a man. It is a disingenuous piece of sophistical argument, such as an unscrupulous advocate might employ to pervert the truth, misrepresent the facts, and misinterpret the language in which the facts belonging to the other side of the case are stated.

"Mr. Morse charges that the deposition of Professor Henry 'contains imputations against his (Morse's) personal character,' which it does not, and assumes it as a duty 'to expose the utter non-reliability of Professor Henry's testimony;' that testimony being supported by the most competent authorities, and by the history of scientific discovery. He asserts that he 'is not indebted to him [Professor Henry] for any discovery in science bearing on the telegraph,' he having himself acknowledged such indebtedness in the most unequivocal manner, and the fact being independently substantiated by the testimony of Sears C. Walker, and the statement of Mr. Morse's own associate, Dr. L. D. Gale. Mr. Morse further maintains that all discoveries bearing upon the telegraph were made not by Professor Henry, but by others, and prior to any experiments of Professor Henry in the science of electro-magnetism; contradicting in this proposition the facts in the history of scientific discovery perfectly established and recognized throughout the scientific world.

"The essence of the charges against Professor Henry is, that he gave false testimony in his deposition in the telegraph cases, and that he has claimed the credit of discoveries in the sciences bearing upon the electro-magnetic telegraph which were made by previous investigators; in other words, that he has falsely claimed what does not belong to him, but *does* belong to others. . . . Your committee do not conceive it to be necessary to follow Mr. Morse through all the details of his elaborate attack. Fortunately, a plain statement of a few leading facts will be sufficient to place the essential points of the case in a clear light." . . .

[After a review of the evidences furnished (unnecessary to be here reproduced), the report proceeds:]

"It thus appears, both from Mr. Morse's own admission down to 1848, and from the testimony of others most familiar with the facts, that Professor Henry discovered the law, or 'principle,' as Mr. Morse designates it, which was necessary to make the practical working of the electro-magnetic telegraph at considerable distances possible; that Mr. Morse was first informed of this discovery by Dr. Gale; that he availed himself of it at once, and that it never occurred to Mr. Morse to deny this fact until after 1848. He had steadily and fully acknowledged the merits and genius of Mr. Henry, as the discoverer of facts and laws in science of the highest importance in the success of his long-cherished invention of a magnetic telegraph. Mr. Henry was the discoverer of a principle, Mr. Morse was the inventor of a machine, the object of which was to record characters at a distance, to convey intelligence; in other words to carry into execution the idea of an electric telegraph. But there were obstacles in the way which he could not overcome until he learned the discoveries of Professor Henry, and applied them to his machine. These facts are undeniable. They constitute a part of the history of science and invention. They were true in 1848, they were equally true in 1855, when Professor Morse's article was published. . . .

"What changed Mr. Morse's opinion of Professor Henry, not only as a scientific investigator, but as a man of integrity, after the admissions of his indebtedness to his researches, and the oft-repeated expressions of warm personal regard? It appears that Mr. Morse was involved in a number of lawsuits, growing out of contested claims to the right of using electricity for telegraphic purposes. The circumstances under which Professor Henry, as a well-known investigator in this department of physics, was summoned by one of the parties to testify have already been stated. The testi-

mony of Mr. Henry, while supporting the claims of Mr. Morse as the inventor of an admirable invention, denied to him the additional merit of being a discoverer of new facts or laws of nature, and to this extent perhaps was considered unfavorable to some part of the claim of Mr. Morse to an *exclusive* right to employ the electro-magnet for telegraphic purposes. Professor Henry's deposition consists of a series of answers to verbal, as well as written, interrogatories propounded to him, which were not limited to his published writings, or the subject of electricity, but extended to investigations and discoveries in general having a bearing upon the electric telegraph. He gave his testimony at a distance from his notes and manuscripts, and it would not have been surprising if inaccuracies had occurred in some parts of his statement; but all the material points in it are sustained by independent testimony, and that portion which relates directly to Mr. Morse agrees entirely with the statement of his own assistant, Dr. Gale. Had his deposition been objectionable, it ought to have been impeached before the court; but this was not attempted; and the following tribute to Professor Henry by the judge, in delivering the opinion of the Supreme Court of the United States, indicates the impression made upon the court itself by all the testimony in the case: 'It is due to him to say that no one has contributed more to enlarge the knowledge of electro-magnetism, and to lay the foundations of the great inventions of which we are speaking, than the Professor himself.'"

The committee, in summing up the various testimonies, justly declare of Professor Henry, that "he has freely communicated information to those who have sought it from him, among whom has been Mr. Morse himself, as appears by his own acknowledgments. But he has never applied his scientific discoveries to practical ends for his own pecuniary benefit. It was natural therefore that he should feel a repugnance to taking any part in the litigation between rival inventors, and it was inevitable that when forced to give his testimony, he should distinctly point out what was so clear in his own mind and is so fundamental a fact in the history of human progress, the distinctive functions of the discoverer, and the inventor who applies discoveries to practical purposes in the business of life.

"Mr. Henry has always done full justice to the invention of Mr. Morse. While he could not sanction the claim of Mr. Morse to the *exclusive* use of the electro-magnet, he has given him full credit for the mechanical contrivances adapted to the application of his invention. . . .

"Your committee come unhesitatingly to the conclusion that Mr. Morse has failed to substantiate any one of the charges he has made against Professor Henry, although the burden of proof lay upon him; and that all the evidence, including the unbiased admissions of Mr. Morse himself, is on the other side. Mr. Morse's charges not only remain unproved, but they are positively disproved.

"Your committee recommend the adoption of the following resolutions:

"*Resolved*, That Professor Morse has not succeeded in refuting the statements of Professor Henry in the deposition given by the latter in 1849, that he has not proved any one of the accusations against Professor Henry, and that he has not disproved any one of his own admissions in regard to Professor Henry's discoveries in electro-magnetism, and their importance to his own invention of the electro-magnetic telegraph.

"*Resolved*, That there is nothing in Professor Morse's article that diminishes in the least, the confidence of this Board in the integrity of Professor Henry, or in the value of those great discoveries which have placed his name among those of the most distinguished cultivators of science, and have done so much to exalt the scientific reputation of the country.

"*Resolved*, That this report, with the resolutions, be recorded in the Proceedings of the Board of Regents of the Institution."

The report was accepted, and the resolutions were unanimously adopted by the Board of Regents.*

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* *Smithsonian Report* for 1857, pp. 88–98.

NOTE I. (From p. 319.)

OVERSTATEMENT OF MORSE'S INVENTION.

It was perhaps to have been expected that the owners of the Morse patents, knowing the influence which the unbiased opinions of Henry (subpœnaed as an expert) undoubtedly exercised upon the minds and decisions of the justices before whom the telegraph suits were brought for trial, should regard with much stronger feeling what seemed to them *adverse* in his testimony, than what was really favorable to their interests. But that the sweeping assumptions advanced by the claimants were unwarrantable, has been distinctly affirmed by the highest judicial authority.

Justice Woodbury, presiding at the United States Circuit Court (Massachusetts), in his decision in 1850, in the case of "Smith *vs.* Downing and others," remarked of the successive reissues of the original Morse patent, with expanding claims: "In his last renewal of 1848 there are introduced for the first time some changes of language, and some tendencies in a part of them (as well as in some of the arguments) to make the claim broader, and as in the letter just quoted, to cover all applications of electro-magnetism, if not of electricity, to convey intelligence, or to telegraph to a distance. . . . As this broader claim goes far beyond what we have already seen was that made in the caveat and in the first specification and in the original patent, as well as in all the subsequent renewals; as it conflicts with much of the language of this very last renewal, looking only to a new method and a mere improvement on what existed before; and as he seems to disavow it in his own evidence; and as on everything in the case, it is at least questionable whether he could have intended to patent anything except an improvement on what before existed, I do not think it just to place a broader construction on his language than the whole subject-matter and description and nature of the case seem to indicate as designed. . . . And I the more readily adopt this course for his own protection, as such broader view might subject his patent to be considered void, both for claiming too much, and for claiming also the invention of a mere principle. It would be claiming too much, as it would cover the application in every way—of electro-magnetism to telegraphs; when this as will be seen hereafter by the history of this subject, and as is sworn to by a large number of highly intelligent experts, had been known publicly and for years before Morse's first attention to the subject in 1832. Indeed he himself virtually admits the truth of this in his testimony. Others no less than the persons cited, as well as the history of the progress on this subject, show that several had before Morse not only made this discovery, but applied both electricity and electro-magnetism to the purpose of telegraphing. But if by his alphabet and record, he has been successful in making an improvement in the use of electricity for that purpose, and wished to secure the new method of doing it, he was at liberty in point of law to make out a patent for that new mode; but for nothing more. He came into the world too late for truly claiming much as new. A large galaxy of discoverers on this subject had preceded him."

To a similar purport was the language of Chief Justice Taney of the Supreme Court of the United States in his final decision in the case of "O'Reilly and others *vs.* Morse and others;" which however went so far as to condemn as untenable the substance of the eighth claim introduced by Morse's reissued patent of 1848. The Chief Justice said: "It is impossible to misunderstand the extent of this claim. He claims the exclusive right to every improvement, when the motive power is the electric or galvanic current, and the result is the marking or printing intelligible characters signs or letters at a distance. . . . The patent confers on him the exclusive right to use the means he specifies to produce the result or effect he describes,—and nothing more. . . . Indeed, if the eighth claim of the patentee can be maintained, there was no necessity for any specification further than to say that he had discovered that by using the motive power of electro-magnetism he could print intelligible characters at a distance. We presume that it will be admitted on all hands, that no patent could have issued on such a specification."*

**Howard's Reports,* vol. xv, pp. 112–119.

NOTE J. (From p. 319.)

HENRY'S APPRECIATION OF PROFESSOR MORSE.

Although Henry (together with several other eminent physicists and electricians,) was summoned by the contestants of Professor Morse's patent, his testimony tended probably quite as much to sustain what appeared to him the patentee's equitable claims, as to restrain his overshadowing pretensions. That both before and after these legal controversies, Henry cherished only kindly feelings toward Professor Morse, the following correspondence will sufficiently attest.

At the close of October, 1837, Henry had learned from Professor Gale, with a naturally warm interest, of his success in operating the Morse recorder by a proper adjustment of the length of coil on his Henry magnet, and a battery of 87 cells (each having about 14 square inches of zinc surface), through the length of five miles of cotton-wrapped copper wire (one-sixteenth of an inch in diameter), coiled on a large reel.* And on the 13th of November following, he was informed of his further success in interposing a second similar reel of wire (making ten miles) in the circuit, with but little diminution of effect.

In the following year, 1838, Henry, during his elaborate and profound researches on electrical "induction" (since become classical), desired to borrow one of these five-mile reels of wire, for the purpose of pressing his inquiries to their furthest extent. Professor Morse being then absent in Europe, his colleague Professor Gale very cheerfully lent the wire. On returning the borrowed wire in 1839, Henry, in acknowledgment of the courtesy, sent both to Professor Gale and to Professor Morse a copy of his memoir (read before the American Philosophical Society, November 2, 1838), "with the respects of the author."

Professor Morse, on his return, addressed a letter to Henry, dated New York, April 24, 1839, in which he said:

"My Dear Sir: On my return a few days since from Europe, I found directed to me, through your politeness, a copy of your valuable "Contributions," for which I beg you to accept my warmest thanks. . . .

"I was glad to learn, by a letter received in Paris from Dr. Gale, that a spool of five miles of my wire was loaned to you, and I perceive that you have already made some interesting experiments with it. In the absence of Dr. Gale, who has gone South, I feel a great desire to consult some scientific gentleman on points of importance bearing on my telegraph. I should be exceedingly happy to see you, and am tempted to break away from my absorbing engagements here to find you at Princeton. In case I should be able to visit Princeton for a few days, a week or two hence, how should I find you engaged? . . . I have many questions to ask, but should be happy in your reply to this letter of an answer to this general one: Have you met with any facts in your experiments thus far that would lead you to think that my mode of telegraphic communication will prove impracticable? . . . I think that you have pursued an original course of experiment, and discovered facts of more value to me than any that have been published abroad. I will not trouble you at this time with my questions until I know your engagements. Accompanying this is a copy of a report made by the Academy of Industry, of Paris, on my Telegraph, which I beg you to accept.

"Believe me dear sir,

"With the highest respect,

"Your most obedient servant,

"Samuel F. B. Morse."

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* This coil of wire, wound on a small axis of iron, formed a solid cylinder eighteen inches long and thirteen inches in diameter. Professor Gale's preparation for this experiment was noticed in Silliman's *Am. Journal of Science* (October, 1837, vol. xxxiii, p. 187). And Professor Morse, in a letter to Mr. A. Vail, dated October 7, 1837, congratulated himself that "Professor Gale's services will be invaluable to us, and I am glad that he is disposed to enter into the matter with zeal."

To this letter Henry replied as follows:

PRINCETON, May 6, 1839.

DEAR SIR: Your favor of the 24th ultimo came to Princeton during my absence, which will account for the long delay of my answer. I am pleased to learn that you fully sanction the loan which I obtained from Dr. Gale of your wire; and I shall be happy if any of the results are found to have a practical bearing on the electrical telegraph. It will give me much pleasure to see you in Princeton after this week; my engagements will not then interfere with our communications on the subject of electricity. I am acquainted with no fact which would lead me to suppose that the project of the electro-magnetic telegraph is impracticable; on the contrary, I believe that science is now ripe for the application, and that there are no difficulties in the way, but such as ingenuity and enterprise may obviate. But what form of the apparatus, or what application of the power, will prove best, can I believe be only determined by careful experiment. I can say however that so far as I am acquainted with the minutiæ of your plan, I see no practical difficulty in the way of its application for comparatively short distances;* but if the length of the wire between the stations be great, I think that some other modification will be found necessary in order to develop a sufficient power at the farther end of the line.† I shall however be happy to converse freely with you on these points when we meet. In the meantime, I remain,

"With much respect,

"Yours, &c.,

"JOSEPH HENRY."

A short time after this, Professor Morse visited Henry at Princeton; and during this first personal interview in May, 1839, received satisfactory answers to various questions presented. Among them, Henry stated that he had no reason to doubt that magnetism could be induced in soft iron "at the distance of a hundred miles or more by a single impulse or from a single battery:" (a striking expression of faith in his own "intensity" magnet:) also, that with a given battery, circuit, and electro-magnet at a distance, the inclusion of intermediate electro-magnets at way-stations would not sensibly reduce the magnetic power at the several points. On the subject of the differences between "quantity" and "intensity" magnets, Professor Morse was still greatly in the dark, and he asked the question, "Is it quantity or intensity which has most effect in inducing magnetism in soft iron?" Henry fully explained to him that for producing the greatest magnetic effects, a "quantity" magnet and battery, with short and free circuit, were required; but that for a long circuit (required for magnetizing at a distance), an "intensity" magnet and battery were indispensable.‡

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*[It must be borne in mind that this was a year and a half after the writer had been informed by Dr. Gale of his successful experiment through ten miles of wire. By "comparatively *short* distances," therefore, he must evidently have intended distances less than those separating our principal cities.]

†[The peculiar form of expression here used, suggesting the probable occasion for another modification "in order to *develop a sufficient power—at the farther end of the line*," points directly to his own contrivance (exhibited before his classes, four years previously) of a supplemental "quantity" magnet and battery at the distant station. Henry had no doubt of being able to magnetize iron at a distance of several hundred miles, and hence evidently did not contemplate dividing the line into a "relay" of circuits, as devised by Professor Morse. His language that a re-enforcement may be necessary "*if the length of the wire* between the stations be great," plainly shows this. But he anticipated that the attractive power developed would be feeble; while he declared his confidence that there were no *scientific* "difficulties in the way." Surprise has been expressed that Henry did not frankly give Professor Morse the benefit of this solution of the suggested difficulty, if it were then in his mind. But is not the subsequent reticence of Professor Morse, on the expedient of a "relay" (invented by him two years previously, as alleged), much more surprising? Henry referred to the enfeeblement on a long line, as a merely "practical difficulty" easily "obviated by ingenuity."]

‡Of the communications made on the occasion of this very interesting and important interview, occupying an "afternoon and evening," we have unfortunately only the result furnished by Professor Morse's very meager statement. (Prime's *Life of Morse*, chap. x, p. 422.) That Henry, in explaining the differing functions of the two

During the long and weary interval in which Professor Morse—with hope deferred—was unavailingly prosecuting his memorial to Congress for assistance, Henry wrote to him the following encouraging and friendly letter:

"PRINCETON COLLEGE, February 24, 1842.

"MY DEAR SIR: I am pleased to learn that you have again petitioned Congress in reference to your telegraph, and I most sincerely hope you will succeed in convincing our representatives of the importance of the invention. In this you may perhaps find some difficulty; since in the minds of many, the electro-magnetic telegraph is associated with the various chimerical projects constantly presented to the public, and particularly with the schemes so popular a year or two ago, for the application of electricity as a moving power in the arts. The case is however entirely different in regard to the electro-magnetic telegraph. Science is now fully ripe for this application, and I have not the least doubt, if proper means be afforded, of the perfect success of the invention. The idea of transmitting intelligence to a distance by means of electrical action has been suggested by various persons from the time of Franklin to the present; but until within the last few years, or since the principal discoveries in electro-magnetism, all attempts to reduce it to practice were necessarily unsuccessful. The mere suggestion however of a scheme of this kind, is a matter for which little credit can be claimed, since it is one which would naturally arise in the mind of almost any person familiar with the phenomena of electricity; but the bringing it forward at the proper moment, when the developments of science are able to furnish the means of certain success, and the devising a plan for carrying it into practical operation, are the grounds of a just claim to scientific reputation as well as to public patronage. About the same time with yourself, Professor Wheatstone, of London, and Dr. Steinheil, of Germany, proposed plans of the electro-magnetic telegraph; but these differ as much from yours as the nature of the common principle would well permit: and unless some essential improvements have lately been made in these European plans, I should prefer the one invented by yourself.

"With my best wishes for your success, I remain, with much esteem,

"Yours truly,

"JOSEPH HENRY."

Professor Morse's biographer, in reproducing this letter, makes the comment: "This was the most encouraging communication Professor Morse received during the dark ages between 1839, and 1843." And he again notices it on a subsequent page: "In the summer of 1842, Professor Morse communicated to the Hon. W. W. Boardman, member of the House of Representatives in Congress, the encouraging letter from Professor Henry, of February 24, 1842."* And when on December 30, of 1842, the Hon. Charles G. Ferris, of New York, reported in the House of Representatives the bill authorizing the construction of the telegraph, this justly valued testimonial of Henry, accompanied Professor Morse's memorial. The Hon. Fernando Wood, of New York (a colleague of Mr. Ferris), in reviewing the history of that enactment some thirty years later, (on the occasion of the memorial proceedings at the Capitol in honor of Professor Morse,) did not forget to remark: "With this letter [from Professor Morse] was another to him from Prof. Joseph Henry, now of the Smithsonian Institution, and then of Princeton College, indorsing and sustaining the application. Professor Henry was deemed high authority on all scientific subjects generally, and especially upon this, to which he had devoted much attention, being himself a successful investigator in electro-magnetic science."† The bill of Mr. Ferris passed the House of Representatives,

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kinds of magnets, would have unfolded the utility of the "quantity" magnet as a terminal re-enforcement of a long "intensity" line, seems highly probable,—if not almost inevitable. If Professor Morse did not profit by it, or failed rightly to apprehend it, this may be explained by his possible preoccupation with the project of dividing a long line into a succession of "relays."

*Prime's *Life of Morse*, chap. x, pp. 423 and 433.

† *Memorial of F. S. B. Morse*, April 16, 1872, Washington, 1875, p. 79.

February 23, 1843; and the Morse appropriation was secured, by passing the Senate, March 3, 1843.

Very shortly after this successful issue, Prof. James C. Fisher, who in the absence of Dr. Gale had taken his place in assisting Professor Morse, wrote to Henry explaining the method proposed for insulating the wires and laying the line of conductors underground, and asking advice as to the best method of wrapping. To this communication Henry replied by letter dated—

"PRINCETON, April 17, 1843.

"DEAR SIR: A friend of mine in Trenton has a machine for winding wire of which he promised to give a description. I will write to you on the subject and send you a copy of his answer. The greatest practical difficulty you will have to contend with, I should think, will be the insulation of the wires. Twine is a partial conductor, and by making the surface sufficiently extended, lateral transmission will take place to some extent. The loss however on this account can only be determined by direct experiment with extended wire. It will probably increase with an increasing ratio; first on account of the greater surface of contact, and secondly because electricity of greater tension will be required to send the current through the longer wire. In order to diminish the number of points of contact, it might perhaps be well to wrap around each wire—besides its continuous covering, an extra strand of coarse twine, with the several turns at a distance from each other. . . ."

When Professor Morse, in August, 1843, received 160 miles of covered copper wire, designed to form two independent circuits, each of a double line of 40 miles in extent, to reach from Washington to Baltimore (one pair for the outgoing circuit and the other for the return circuit), he invited Henry and others to be present at a preliminary experiment in New York City, on the 8th of August, to test the capacity of electrical transmission. This very interesting trial with so unusual a length of conductor would for the first time decide the correctness of Henry's opinion that magnetization could be effected "at the distance of a hundred miles or more by a single impulse." This critical test—never before attempted, Henry was unfortunately prevented from witnessing, by reason of his professional duties. The experiment was eminently successful with a battery of 100 Grove elements; and the magnet was operative with even half that number. The following letter to Professor Morse expressed Henry's regrets at being compelled to miss such an opportunity:

"PRINCETON, August 22, 1843.

"MY DEAR SIR: I hope you will pardon me for not before acknowledging the receipt of your kind letters of invitation to attend your galvanic exhibition. My time has been so much occupied during the last three weeks with an extra course of lectures and our examination, and so little at my own disposal, that I was unable to say whether I could be in the city on the day you mentioned or not. I did hope however to get away, but the examination prevented. Dr. Torrey was also engaged, and could not leave. I do not know however that I could have done much in the way of original experiments in the course of a single day. I am not quick in the process of inventing experiments unless my mind is thoroughly aroused to the subject by several days' exclusive attention to the work, and then I am obliged to pause between each effort.* I have not been able since I last saw you to devise a satisfactory process for determining the velocity of *galranic* electricity; and on reflection I did not think it worth the expense which would be incurred, to have a machine constructed for the mere repetition of the experiments of Wheatstone.

"I think it probable that I shall visit the city next week, as I shall be unemployed from this time until a week from next Monday. If there is any prospect of your

*[An indication of the logical care bestowed by Henry on his experimental work, and the key to his successes. He had little confidence in the profit of empirical or "haphazard" trials.]

repeating any of your experiments previous to that time, I will be with you on any day you may appoint.

"With much respect and esteem,
"Yours truly,
"JOSEPH HENRY."

The answer to this, or whether any further preliminary experiments were jointly performed on the 160 miles of wire, does not appear. As the line of wires between Washington and Baltimore was being laid, Henry, anxious to emphasize the importance of keeping the separate wires at some distance apart throughout their circuit, addressed to Professor Morse the following friendly letter on the subject:

"PRINCETON, January 24, 1844.

"MY DEAR SIR: I am anxious to hear from you in reference to the telegraph, and I have intended to write to you on the subject for a month past, but extra college duties have occupied all my thoughts and all my time since the beginning of the present term. During the last vacation I occupied myself as usual with my investigations in electricity, and among other results, I arrived at one which I think may have an important bearing on the success of the telegraph. It is this: while a current of electricity is passing through a wire, one part of the conductor is constantly *plus* to any other part which succeeds it, the difference in the degree of the electrical state constantly increasing as the distance of the two points is greater. The maximum difference is therefore at the two ends; and when the two extremities of long wires are brought into near approximation, there is a great tendency in the elecricity to cut across from the one to the other. This tendency is not due as has been supposed, merely to the great resistance of the long wire and the cross-cut offering a less resisting channel, but to the fact of the one part being positive and the other negative, and the consequent great attraction of the electricity in the one part for the unsaturated matter in the other. . . . On reading your letter on the subject of the telegraph in the newspapers, I was struck with the idea that you had probably met with the very difficulty my researches have led me to anticipate. If this is the case, and your insulation is not found sufficient, you have no cause to blame yourself, since the previous state of knowledge on the subject of electricity could not lead you to suspect such a condition of things.

"With much respect,
Yours truly,
"JOSEPH HENRY."

The danger apprehended by Henry was realized; and of the nine miles of quadruple conductors laid in the ground, Professor Gale had already discovered that the galvanic current could not be carried through a single mile; a result partly due to the injury done to the insulation of the wires at some points, in the process of enveloping them in a tube, and partly to the energetic induction from the "extra current" first discovered by Henry. In a couple of weeks, Professor Morse wrote to Henry as follows:

"BALTIMORE, February 7, 1844.

"MY DEAR SIR: You must think it strange that I have not answered your letter of the 24th ultimo before this; but I have this moment received it in passing through this place on my way to New York, which I trust will be a sufficient apology for my apparent neglect. I have read your letter with much interest, and it has determined me to make you a visit on my return from New York, which will be the beginning of the week, perhaps on Tuesday morning, the 13th instant. . . . I found the difficulty which you apprehend in the insulation of my wires; but this I will explain when I have the pleasure of seeing you.

"In the mean time, believe me, with sincere respect,
"Your most obedient servant,
"SAMUEL F. B. MORSE."

At his next interview with Henry on the 13th of February, 1844, (on his way *from* New York,) he was advised to suspend his wires through the air on poles, at a sufficient elevation to avoid injury from the recklessness of mischievous boys: as Henry feared that the risk of "cross-cut" on long lines, even with good insulation, was scarcely avoidable.* Henry also informed him that this plan had been successfully adopted by Gauss and Weber ten years previously.

Professor Morse, who had thought of this method before, but with much distrust, at once determined to carry it out, and early in the following month, March, made preparations for its execution. Two methods of suspension were suggested, the first plan (that of Mr. Vail), the gathering of the four wrapped or insulated wires together at their supports, requiring but a single insulator on each pole, to which Professor Morse was himself inclined as involving least cost; the second plan (that of Mr. Ezra Cornell), the scattering of the wires, and the supporting of them apart on independent insulators. The following is Professor Morse's account to Mr. Cornell of a second interview and consultation with Henry on this subject, on the 1st of March, 1844, (on his way *back to* New York,) which he inadvertently confounds with his preceding interview two or three weeks earlier:

"On my way to New York, where I went to order the fixtures, I stopped at Princeton, and called on my old friend Professor Henry, who inquired how I was getting along with my telegraph.† I explained to him the failure of the insulation in the pipes, and stated that I had decided to place the wires on poles in the air. He then inquired how I proposed to insulate the wires where they were attached to the poles. I showed him the model I had of Mr. Vail's plan; and he said: 'It will not do; you will meet the same difficulty you had in the pipes.' I then explained to him your plan, which he said would answer."‡ And this is the method since universally adopted in this country. On the 24th of May following, the first message was sent over the completed telegraph line by Professor Morse from Washington to Baltimore, and immediately repeated by Mr. Vail from Baltimore back to Washington.

The success of this new enterprise (foreseen, encouraged, and promoted, by Henry) having been assured, various competitors sprang up as usual, (with similar and with dissimilar systems,) to share in its benefits and profits; and in a few years numerous litigations arose in resistance of real or supposed infringements. Notwithstanding the zeal and bitterness infused into these controversies by interested partisans, Henry never lost his interest in the success of Professor Morse's plan of telegraphing; but while desirous that meritorious rival schemes (such as that of the printing telegraph, —first invented by Alfred Vail, in September, 1837, and developed by Royal E. House in 1846, to a practical operation) should have a fair trial, he steadily refused to be made a party to any such discussions; until at last he was summoned by *subpœna* to attend a trial at Boston, to testify to the pre-existing state of the art.§ In occupying

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* "Mr. Morse visited me at Princeton to consult me on the arrangement of his conductors. During this visit we conversed freely on the subject of insulation and conduction of wires. I urged him to put his wires on poles." (*Smithsonian Report* for 1857, pp. 112, 113.

† [Such an inquiry would appear superfluous in view of Professor Morse's recent letter dated February 7. The whole coloring of the interview is inaccurate.]

‡ Prime's *Life of Morse*, chap. xi. pp. 479, 480. A treatise on the "Telegraph," just published, gives the following account of the plan adopted: "An arm thirty inches long, with a pin at each end, bearing a glass bureau-knob,—an insulation proposed by Mr. Cornell and approved by Professor Henry, was secured to the upper end of each pole. Around the bureau-knobs the conducting wires were wrapped." (*The Telegraph in America.* By James D. Reid. 8vo. New York, 1879, chap. xi, p. 116.)

§ "A series of controversies and law-suits having arisen between rival claimants for telegraphic patents, I was repeatedly appealed to to act as expert and witness in such cases. This I uniformly declined to do, not wishing to be in any manner involved in these litigations, but was finally compelled under legal process to return to Boston from Maine, (whither I had gone on a visit,) and to give evidence on the subject." (*Smithsonian Report* for 1857, p. 87.)

a position so distasteful to his sensitive and generous nature, it may well be supposed that however reserved and cautious his attitude, and whatever his preferences, the answers (necessarily conscientious) drawn from him by skillful attorneys defending the alleged infringements, and the coloring given to such answers in their elaborate arguments, would be little calculated to please the plaintiffs,—naturally intent on the broadest scope and comprehension of their claims. And from this time, Professor Morse, under the misjudging influence of interested supporters, seemed to forget that Henry had been among the most serviceable and unselfish of his many friends.

In 1854 Professor Morse's patent (of fourteen years from 1840) was about expiring, and an application for its extension for seven years longer, according to the provisions of the law, was pending before the Hon. Charles Mason,—one of the most able, conscientious, and indefatigable of Patent Office Commissioners. Inclined from the testimony he had examined, to believe that the merits of Professor Morse's invention had been greatly overestimated, and that his patent from the breadth of interpretation it had received, was acting to some extent as an obstruction to further progress in the art, he consulted with his friend, Professor Henry, as to the independent value of the Morse system, in view of the antecedent state of the art. Henry, with no other sentiment than that of impartial arbitrator, represented that Professor Morse, without the advantage of scientific culture, had the great merit of having combined and of having energetically developed and established a system of electro-magnetic telegraphy, in its method of signaling and of recording, the most efficient of contemporary methods. He referred to the needle-telegraph of his personal friend, Professor Wheatstone (whom he regarded as one of the most intelligent and ingenious of modern physicists), as being in his judgment inferior practically to the Morse telegraph; and he urged that care should be taken not to let the extravagant pretensions of Professor Morse's would-be friends lead to the opposite error of underrating an invention which was certainly of far greater value to the community, than any remuneration which had yet been reaped by its author from the short-lived monopoly.

The application of the patentee was granted by the Commissioner; and the patent was legally extended for seven years from the 19th of June, 1854. Professor Morse, in ignorance of this service, had at the time unfortunately written (or at least given his signature to) the ungracious and ungrateful assault on Henry, as a pretender in science, and a detractor of merit, when rising fame excited his envy. And early the following year, to the injury of himself alone, had the stricture published in a pamphlet, and widely distributed.

As a sufficient corrective of the strange misconception of his disposition and motives, Henry inquired of Judge Mason, if he recalled their interview on the question of extending the Morse patent; and the Commissioner of Patents responded in the following letter:

"UNITED STATES PATENT OFFICE, March 31, 1856.

"SIR: Agreeably to your request, I now make the following statement: Some two years since, when an application was made for an extension of Professor Morse's patent, I was for some time in doubt as to the propriety of making that extension. Under these circumstances I consulted with several persons, and among others with yourself, with a view particularly to ascertain the amount of invention fairly due to Professor Morse. The result of my inquiries was such as to induce me to grant the extension. I will further say that this was in accordance with your express recommendation, and that I was probably more influenced by this recommendation, and the information I obtained from you, than by any other circumstance, in coming to that conclusion.

"I am, sir,

"Yours very respectfully,

"CHARLES MASON."

"Prof. J. HENRY."

NOTE K. (From p. 322.)

THE DATE OF PROFESSOR MORSE'S "RELAY."

Although the depositions of Professor Morse, and of his principal assistant (given in law suits more than ten years after the event), assign from memory as the date of invention of the "relay" the spring of 1837, all the documentary evidence existing, points rather to the spring of 1838, as the date of its inception. First, we should expect at least a reference to this device in the article prepared for Silliman's Journal of Spetember, 1837, in announcing the intention of experimenting with "a circuit of several miles." Secondly, we should certainly expect to find it spoken of as a saving expedient in the caveat of October 3, 1837, if it were at that time in the author's mind, and he were desirous of protecting it. Thirdly, we should expect to find it unavoidably brought forward (at least as a suggestion) before the committee of the Franklin Institute, February 8, 1838, when the doubt was expressly discussed in the committee's report as to the practicable distance to which the telegraph could be made to signal. This conspiracy of silence, this conspicuous absence (in every published case) of the slightest hint upon the subject, although so directly prompted and invited, is difficult (*ex post facto*) to account for. The earliest documentary reference now extant, to a junction of circuits, occurs in the application for a patent signed by Professor Morse April 7, 1838.

On filing this application in the Patent Office, he had requested that it might be retained in the secret archives, unacted upon, until he should have procured his foreign patents. He left this country for Europe with that object May 16, 1838, and returned to New York April 15, 1839. For a year or more afterward he took no step toward procuring his patent, till he wrote the following letter to the "Hon. H. L. Ellsworth, Commissioner of Patents":

"NEW YORK, May 2, 1840.

"DEAR SIR: I have never received my patent papers from your office. I believe there was something to be done on my part in relation to a drawing for one of the duplicates, which I was prevented from accomplishing by the necessity of preparing suddenly for my visit to Europe with the telegraph. I have nearly completed an improved apparatus for which I intend to take out a patent, adding it to my patent already executed, as an improvement. . . .

"Your old friend and classmate,

"SAMUEL F. B. MORSE."

To this the Commissioner replied as follows:

"PATENT OFFICE, May 14, 1840.

"SIR: The specifications and drawings of your alleged improvement in the mode of communicating signals by the application of electro-magnetism are herewith returned to you, the explanatory reference in the same not being sufficient to properly illustrate the invention. Some annotations pointing out the parts where these are wanting are marked in pencil in the margin of the description.

"Your favor of the 2d instant has been received; in reply to which the office has to state that the delay attending the granting of your application has not been caused by any want of attention on its part. Some two years since, when your patent was about being issued, a request was made by you that the case might be postponed until you should have received letters patent from the European governments. This request was complied with, and as no communication has been received from you since in relation to the issuing of the patent, the case has been permitted to lie over. The patent will be issued however immediately on the return of the papers.

"Yours respectfully,

"H. L. ELLSWORTH."

The amended specification and a duplicate set of drawings were returned to the Patent Office by Professor Morse, with a letter dated New York, May 18, 1840. It was then discovered that the original oath of invention required by law was defective in

omitting a specific date, the space for the day and the month having been left blank. The applicant having been informed of this by official letter dated May 26, 1840, a new affidavit, properly executed, was sent to the Patent Office May 29, 1840, and the patent was finally issued June 20, 1840.

Whether the true date of the invention of the "relay," by Professor Morse, be 1837, or 1838, is not regarded as a matter of any importance historically, as in either case, he is fully credited with its original conception.

NOTE L. (From p. 325.)

ALPHABETIC BINARY NOTATION.

It seems proper to take some notice of the growth of that beautiful invention, the bi-signal alphabet. Its origin appears to be considerably earlier than that of its congener, the binary arithmetical notation devised by Leibnitz two hundred years ago. An alphabetic code of signals is indeed as old as the time of the Greek historian Polybius (150 years before the Christian era), who describes in the tenth book of his General History a method of signaling to a distance any required dispatch by means of torches,—which he says was invented by Cleoxenus and Democlitus, and perfected by himself. In this scheme the Greek alphabet of 24 letters is distributed into five series or tablets, each comprising five letters: (the last space being vacant.) Then torches (from one to five) exposed on the left side, will indicate the group or tablet; and similar torches raised on the right side, will indicate the place of the letter on the tablet.* This system may obviously be very easily resolved into a bi-signal alphabet. It appears that the emperor Leo VI, (of the eastern division of the empire) about the year A. D. 900, in a chapter of his "Military Tactics," on naval warfare, described a plan somewhat similar to the above.†

An early English example of the bi-signal alphabet is to be found in Francis Bacon's "Advancement of Learning," published in 1605. In this Treatise, discoursing on cryp, tography, he observes: "We shall here annex a cipher of our own, that we devised at Paris in our youth. . . . The invention is this: let all the letters of the alphabet be resolved into two only, by repetition and transposition; for a transposition of two letters through five places or different arrangements, will denote two-and-thirty differences, and consequently fewer or four-and-twenty,—the number of letters in our alphabet." (It will be remembered that at this date the letters J and U had not been differentiated from I and V.) Bacon then gives an example of "a bi-literal alphabet" consisting of the permutations of "a" and "b" through five places; and he subjoins the comment that "this contrivance shows a method of expressing and signifying one's mind *to any distance*, by objects that are either visible or audible, provided the objects are capable of two differences, as bells, speaking-trumpets, fire-works, cannon, &c."‡

In the "Cyclopædia" of Doctor Abraham Rees, published early in the present century (1802–1819), under the word "cipher" are presented among a variety of interesting alphabetic notations, examples of one formed by the combinations of three characters, and of one formed by two characters; the latter evidently copied from Bacon. The compiler says: "Another mode of corresponding by cipher is striking two, or three-bells of various sizes." After remarking that two symbols require a larger combination for each letter than three, and giving an example of each kind, the writer adds: "The effect will be the same, whether the writer make use of arithmetical characters, letters, dots, lines, mathematical diagrams, or any other sign which admits of two, or of three differences." Employing as an instance the figures 1 and 2, he makes use of five recurrences for each letter, as in the example given by Bacon, and he follows a

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* Polybius's *History*; lib. x. cap. 45. Greek and Latin edition of A. F. Didot, Paris, 8vo. 1852. pp. 474, 475.

†"The emperor Leo VI, in his chapter on naval tactics (chap. xix), describes almost exactly Myer's army code, concluding with the remark, 'as the ancients did.'" (*Johnson's Universal Cyclopædia*; edited by Dr. Barnard: art. "Naval Signals," vol. iii. p. 734.)

‡ *On the Dignity and Advancement of Learning*, book vi, chap. i.—Bohn's edition, 1858, pp. 222, 223.

similar order of permutations. The two symbols—the single dot or period (.), and the double dot or colon (:),—are also employed for the same purpose. *

In the following table are displayed several examples of bi-signal alphabets, chronologically arranged. † In the first column, the two symbols "a" and "b," and in the second column the two symbols "1" and "2," may stand for dots, lines, colors, bells, or any other distinctions of sight or sound, as indicated by Bacon and by Rees. In the third column is exhibited the notation of an acoustic alphabet devised by Mr. James Swaim, of Philadelphia, and published in 1829, in a pamphlet entitled "The Mural Diagraph, or the Art of Conversing though a Wall." In this scheme (sometimes designated the *prison* alphabet), the symbol "t" signifies an audible tap or knock, and the "s" an audible scratch. ‡ In the next three columns, the two symbols "r" and "l" represent a movement of a galvanometer needle to the *right* and to the *left*. In the last three columns, the symbols "s" and "l" represent a short mark or dot, and a long mark or dash.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
	Bacon.	Rees.	Swaim.	Schilling.	Gauss & Weber.	Steinheil.	Original Morse.	Later Morse.	European Morse.
	1605.	1809.	1829.	- - - -	1833.	1836.	1838.	1844.	1851.
A	aaaaa	11111	t	rl	r	lrl	sss	sl	sl
B	aaaab	11112	tt	rrr	ll	lrrl	ss ss	lsss	lsss
C	aaaba	11121	ttt	rll	rrr	llr	s ss	ss s	lsls
D	aaabb	11122	tttt	rrl	rrl	rl	sss s	lss	lss
E	aabaa	11211	s	r	l	l	s	s	s
F	aabab	11212	ss	rrrr	rlr	lrr	s sss	sls	ssls
G	aabba	11221	sss	llll	lrr	rrl	ss s	lls	lls
H	aabbb	11222	ssss	rlll	lll	rrrr	ssss	ssss	ssss
I	abaaa	12111	ts	rr	rr	r	sl	ss	ss
J	- - - -	12112	t tts	rrll	- - - -	r	ss s	lsls	slll
K	abaab	12122	t t	rrrl	rrr	llr	lsl	lsl	lsl
L	ababa	12211	t tt	lrrr	llr	rll	l′	l′	slss
M	ababb	12212	t ttt	lrl	lrl	rrr	lss	ll	ll
N	abbaa	12221	t tttt	lr	rll	rr	ls	ls	ls
O	abbab	12222	t s	rlr	rl	lll	ss	s s	lll
P	abbba	21111	t ss	llrr	rrrr	rllr	sssss	sssss	slls
Q	abbbb	21112	t sss	lllr	- - - -	- - - -	ssls	ssls	llsl
R	baaaa	21121	t ssss	lrr	rrrl	ll	s s	s ss	sls
S	baaab	21122	t ts	ll	rrlr	llrr	sls	sss	sss
T	baaba	21211	tt tts	l	rlrr	lr	lls	l	l
U	- - - -	21212	tt t	llr	lr	rlr	sll	ssl	ssl
V	baabb	21221	tt tt	lll	rlr	rlr	l	sssl	sssl
W	babaa	12121	tt ttt	rlrl	lrrr	rlrl	ssl	sll	sll
X	babab	22212	tt tttt	lrlr	- - - -	- - - -	ll	slss	lssl
Y	babba	22221	tt s	rllr	- - - -	- - - -	sl	ss ss	lsll
Z	babbb	22122	tt ss	rlrr	rrll	rrll	sls	sss s	llss

* Rees' *Cyclopædia*, vol. viii, art. "Cipher."

† Of two early alphabets for the electric telegraph,—that of Lomond in 1787, and that of Dyar in 1828, no records appear to exist. A plan was suggested by Henry at Albany in 1831 or 1832, for indicating letters on a bell by the number of their position in the alphabet: "a" by 1, "b" by 2, "c" by 3, &c. Thus the words "come back" would be represented by the following taps: 3–15–13–5—2–1–3–11; the word "electromagnet," by 5–12–5–3–20–18–15—13–1–7–14–5–20. The cipher or zero occurring at the 10th letter "j," and at the 20th letter "t" would be indicated by a rapid rattle of the bell. It does not appear however that this alphabet was actually employed, unless perhaps experimentally.

‡ *The Mural Diagraph*, etc. "Through the wall they are content | To whisper, at the which let no man wonder." Midsummer Night's Dream, v. i. By James Swaim. 16-mo. 24 pages. Philadelphia. Printed by Clark & Raser. 1829. pp. 13, 14. The signs were used numerically; and beyond "26" (the letters of the alphabet) were applied to a numbered vocabulary.

The *first* column in the above tabular view, represents the scheme proposed by Bacon, and designated by him "A Bi-literal Alphabet;" a scheme—as he points out, "practicable in all things that are capable of two differences." The advantage of representing every letter by five tokens, is that it dispenses with the necessity of spacing the letters from each other.

The *second* column represents an alphabet shown and described in Rees' "Cyclopædia" as already referred to. In this alphabet the first nine letters follow exactly the notation of Bacon. After the interpolated letter J, (which takes the symbol for K,) the remainder of the alphabet from K to V inclusive, follows regularly the notation of Bacon—shifted two letters downward. The only symbols differing from Bacon's, are those for X, Y, and Z.

The *third* column gives the alphabet of Swaim above mentioned. The author has not been successful in arranging for his letters the simplest combinations of taps and scratches which might have been selected; having given to N, R, T, and W, five signals, and to X, six; while four of his signs are sufficient to represent 30 different characters. Moreover by adopting a *numeral* system of designation, he has been driven to the awkward and entirely unnecessary expedient of introducing spaces into letters in seventeen cases, or in two-thirds of the alphabet; that is in all letters following the ninth letter—I.

The *fourth* column gives the alphabet of Schilling, as represented in Vail's "Electro-Magnetic Telegraph:" (page 156.) The date of this is uncertain; involving as it does the question when Schilling first employed a single circuit and a single galvanometer in his telegraphic arrangement. Whether he or Gauss and Weber first devised this very important simplification is equally undetermined; though the presumption is in favor of Schilling having been the first to introduce the bi-signal alphabet into telegraphy. With a judicious distribution of the simplest signs to the most frequent letters, the average number of elementary signals need not exceed two and a half for every letter used, (or just one-half the number required by Bacon's alphabet,) in any lengthy communication. Steinheil, who was very imperfectly acquainted with Schilling's labors, appears to regard his system as imitated from that of Gauss and Weber.*

The *fifth* column gives the alphabet of Gauss and Weber, as represented in Turnbull's "Electro-Magnetic Telegraph." † In this alphabet C and K have the same symbol; as have also F and V.

The *sixth* column gives the alphabet of Steinheil as represented in Dub's *Anwendung des Elektromagnetismus:* Berlin, 1863: (2d ed. 1873, sec. v, page 343:) in Vail's Treatise; (page 182:) and in Turnbull's Treatise; (1853, page 97.) In this alphabet C and K have the same character; I and J have the same; and U and V have the same; the letters Q, X, and Y, being dispensed with. Steinheil remarks of its arrangement, "The alphabet I have chosen represents the letters that occur the oftenest in German, by the simplest signs"; a plan also adopted by Schilling and by Gauss.

The *seventh* column gives the original alphabet of Morse, as devised by him (or by his assistant—Mr. Vail) in 1838; and for the first time described in his application for a patent dated April 7, 1838. This is accordingly the alphabet presented in Morse's first patent, dated June 20, 1840. In this, he has given the same symbol to G and J; the same to I and Y; and the same to S and Z. It must be borne in mind that down to the year 1838, Professor Morse had conceived only the naval system of signals by means of numbered words, and the method of recording such numbers by the alternating or continuous zig-zag mark, equivalent to the right and left deflections of Steinheil's register;‡ and that not till some time in January of that year (1838), did he make the great advance of substituting the up and down movement of the armature recorder, for its transverse motion. He then for the first time made his telegraphic communi-

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* Sturgeon's *Annals of Electricity*, etc. vol. iii, pp. 448, 450.

† Second edition, 1853, p. 60.

‡ New York *Journal of Commerce*, of September 7, 1837, and of January 29, 1838.

cations by means of an alphabet; and improving on his predecessors, devised this alphabet in its simplest form, of a rectilinear succession of dots and lines.

A few years later, the modification given in the *eighth* column was adopted;* being the code now in use in this country. This second alphabet of Morse retains but seven of the letters in his original alphabet; namely, E, H, K, L, N, P, and Q. The remaining symbols are changed in their application. Both of these alphabets present the anomaly of employing for the letter L the unique symbol, a dash of double length: a symbol whose combinations with dots might have been much more appropriately reserved for designating numerals. And they both also present the very awkward arrangement of introducing in five or six cases, a space in the middle of a letter. This occurred with B, C, D, F, G or J, and R, in the first alphabet, and remains with C, O, R, Y, and Z in the later alphabet. Whence it becomes difficult to distinguish between C and IE, between O and EE, between R and EI, between Y and II, and between Z and SE; and if on the other hand the intra-literal space be made too brief, C or R may easily be mistaken for S, O for I, and Y or Z for H.

The *ninth* and last column gives the alphabet adopted by the Vienna convention in October, 1851, for European languages; as represented in Prescott's larger treatise on *Electricity and the Electric Telegraph*, 1877: (page 480.) This alphabet avoids the obvious blunder in Morse's notation, and presents a homogeneous system. In this code eleven of the Morse letters are changed: C, F, L, and R, having been taken from Gerke's alphabet, O, and P, from Steinheil's, and J, Q, X, Y, and Z, from other sources. Of the *original* "Morse alphabet" only four letters are retained, viz, E, H, K, and N. This European or "international" alphabet is however in a few of its symbols, better adapted to the German than to the English language. Accordingly in the Atlantic cable alphabet, the two letters M (ll), and O (lll), have been transposed; as in English the letter O occurs nearly three times as frequently as the letter M.

We thus perceive by what apparently small steps so simple a contrivance as an alphabetic notation, (scarcely demanding the exercise of invention,) has been successively modified and improved. But although the "Vienna" alphabet is now universally employed elsewhere, American operators have not yet had the intelligent courage to incur the temporary additional labor and inconvenience of change, for the permanent advantage of a more perfect system. †

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*Represented in Vail's Treatise, 1845, p. 27; in Turnbull's Treatise, 1853, p. 73; in G. B. Prescott's *Hist. of Electric Telegraph*, 1860, p. 89; and in F. L. Pope's *Modern Practice of the Electric Telegraph*, 4th ed. 1871, p. 101.

† "It has been proposed to introduce the European alphabet in this country also; but although the advantages of such a reform would doubtless be numerous, yet it may perhaps be better to suffer some inconvenience from an acknowledged imperfection, than to attempt to remedy it by introducing a change that would for a time cause serious annoyance to the thousands of skillful operators now in the service." (Prescott's *Electricity and the Electric Telegraph*, 1877, chap. xxx, p. 431.)

THE EFFECT OF IRRITATION OF A POLARIZED NERVE—"PFLÜGER'S ELECTROTONUS."

By B. F. Lautenbach, M. D., Ph. D.,

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HISTORICAL RÉSUMÉ.

Ritter* observed, when he applied for a long time (½ hour) a strong galvanic battery to a nerve, that there resulted a continual decrease in the movements of the finger and the arm on the silver (*i. e.*, negative) side of the battery. In the same parts on the zinc (positive) side he observed a continual increase in the motor effects of the current. This effect lasted for a short time after the experiment was discontinued.

On carefully repeating this experiment, Ritter came to the result that the current developed by the battery inhibited the voluntary movements in the arm to which the negative electrode was applied, while the mobility of the other arm, to which the positive electrode was applied, was increased.

Du Bois Reymond† attributed these results to diminution and augmentation of the irritability of the nerves caused by the constant current; the augmented excitability being produced by the passage of an ascending current, while the diminished excitability was caused by a descending current.

In 1828–'30 Nobili‡ observed certain facts which bear more nearly on our present subject than those observed by either of the previous experimenters. This investigator found that frog preparations, which through accident had become tetanized, grow quiet when a current in a special, or possibly in any, direction, was passed through the nerve. In explanation, Nobili believed that the constant current places the nerve in such a state as to render impossible the receiving and conducting of the contraction-producing cause. Nobili, at the same time, recommended his discovery to physicians for the cure of tetanus.

Matteucci§ made some experiments on this subject, but these resulted in but little that was not previously known. With the exception that he proved that the relief afforded in tetanus by a constant current is but

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* Beiträge zur näheren Kenntniss des Galvanismus, etc., Jena, 1802, B. ii.

† Unters. iiber thierische Electrici tät, B. i, p. 367.

‡ Analyse expér. et théor. des phén. phys. produits par l'électric. sur le grenouille, etc., Annales de chimie et phys., 1830, p. 91.

§ Essai sur les phén. électr. des animaux, Paris, 1840, 8, p. 29.

transitory and that currents travelling in both directions act paretically, his results were but confirmatory of those obtained by Nobili.

The first who really systematically investigated this subject was Valentin.* This investigator applied the constant electrodes to the ischiadicus, just at the entrance of this nerve into the gastrocnemius, while the irritating electrodes were applied at the point of exit of the nerve from the pelvis. Valentin found that when the constant current was passing through the nerve the irritating current gave a weaker contraction than when this was not the case, or, at times, none. This author also showed that the same diminution in the effect of the irritating current occurred when this was placed between the constant current and the muscle. This latter result, however, was produced in the experiments of Valentin only when the current was ascending, and not when a descending current was employed.

Eckhard† confirmed the observations of Nobili and Valentin. He found that an electrical irritation can be made to lose its effect when between it and the muscle a constant current is made to pass through a given portion of the nerve. Not only did he find this to be true for electrical but also for mechanical and chemical irritants. This inhibitory effect was manifest when the polarizing or constant current was made to pass in either an ascending or a descending direction, provided that this current was of a certain strength (5–6 large Daniel elements). This author also confirmed the statement of Valentin that when the irritation (mechanical, chemical, or electrical) is applied to the nerve above the point where this is being polarized the effect is no longer so constant.

In his first paper Eckhard made the statement, which he afterwards withdrew, that the "paretic" effect was most constant when an ascending polarizing current was used.

In a second paper‡ Eckhard irritated by means of an induced current, and measured the muscular contractions thereby produced by means of a Helmholtz myograph. His previous observations were confirmed. When the constant current was applied to the nerve above the irritation, ascending polarization only diminished the effect of the irritation, thus showing a diminished excitability of the nerve between the positive electrode and the muscle. When the descending current was employed a state of augmented excitability of the nerve was produced between the negative electrode and the muscle.

Pflüger,§ whose experiments and "laws" will frequently be referred to in this paper, was the next investigator who devoted his atttention to this field of research. He made use of weak currents, while the pre-

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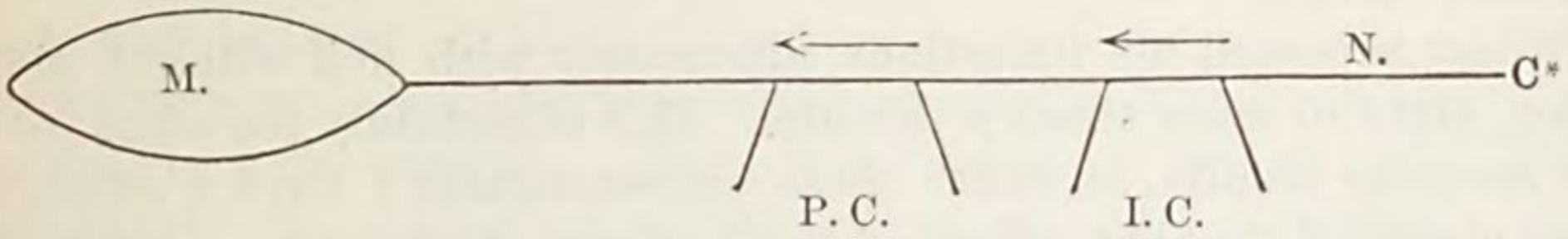
*Lehrb. der Phys. des Menschen, B. ii, Abth. 2, p. 155.

†Der galv. Strom als Hinderniss der Muskelzuckung. Zeitschr. für rat. Med., N. F., B. iii, p. 198.

‡Ueb. den Einfl. des const. galv. Stromes auf die Erregbark. der motor. Nerven, Beiträge zur Anat. und Phys., H. 1, 1855, p. 25.

§Allgem. Centralzeit., 1856, Nov. 22, 1857. Unters. über die Phys. des Elektrotonus, Berlin, 1859.

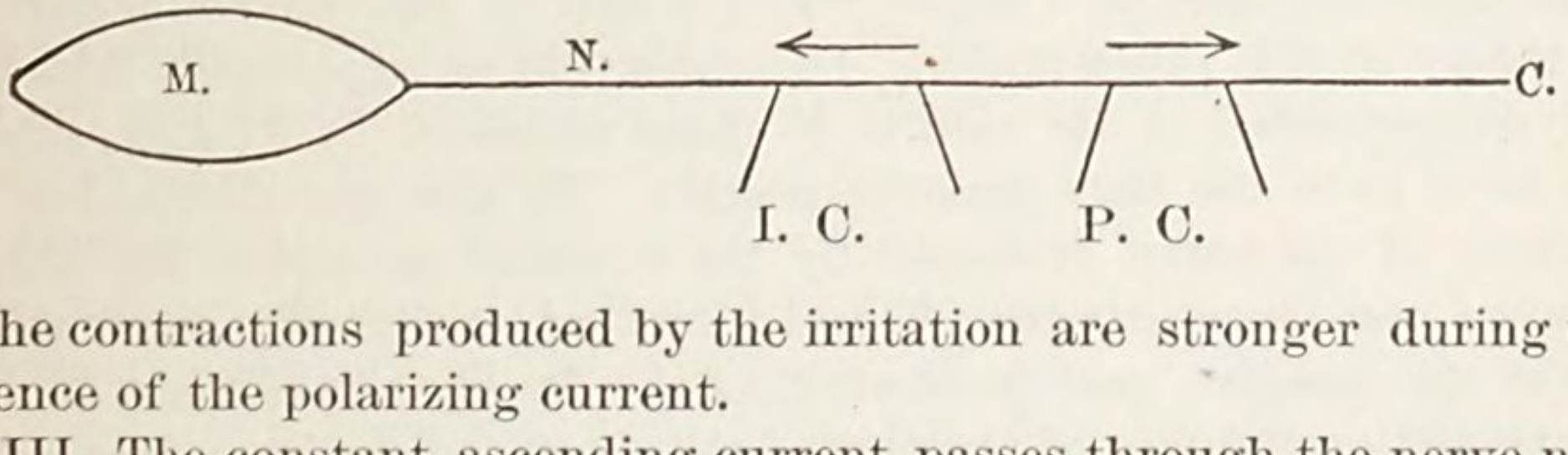
ceding investigators always employed strong currents. This author found that the ascending polarizing current did not under all conditions produce a diminution in the excitability of the nerve. The following are the results of this investigator:



"I. When a constant descending current is passed through the sciatic nerve near the gastrocnemius, and a descending irritating current is applied immediately above this, I found the irritation to give a smaller contraction when the constant current was passing through the nerve than when this was not the case."

Under these circumstances the muscular contractions were increased during the passage of the current.

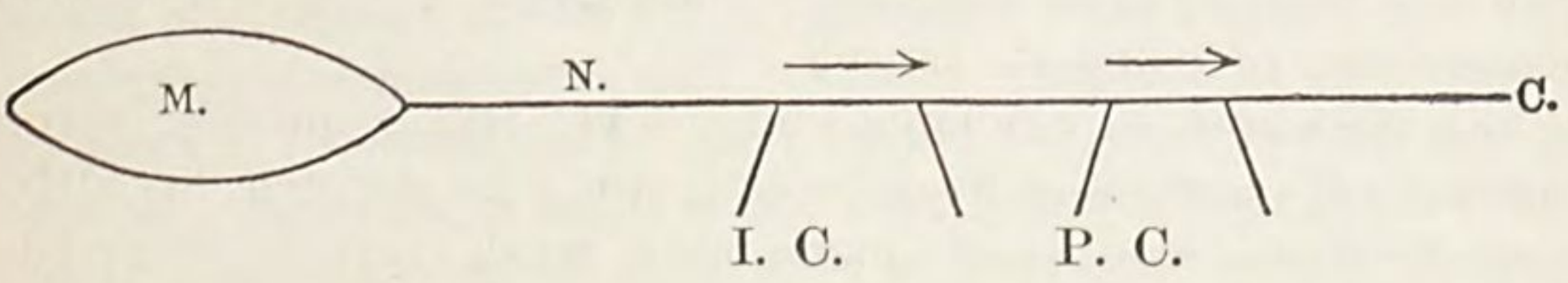
"II. The constant descending current passes through the nerve near the central end, a descending irritating current is applied to the nerve nearer the muscle. The irritations seem stronger when the constant current was absent."



The contractions produced by the irritation are stronger during the absence of the polarizing current.

"III. The constant ascending current passes through the nerve near the muscle, while the irritation was made at a more central portion. During the presence of the constant current the contractions are stronger than when it is absent."

"IV. The constant ascending current is applied to the nerve near the plexus, while the ascending irritating current is applied nearer the muscle. During the presence of the constant current the contractions are less strong than when this is removed."



Contractions less strong during the passage of the polarizing current.

In conclusion Pflüger sets up the theory that *the action of all irrita-*

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*In these diagrams, which are added by the author for the easier understanding of the views of Pflüger, M stands for the muscle, N for the nerve, and C for its central end; I. C. and P. C. stand for irritating and polarizing current. The arrows give the direction of the current.

tions which lie to the side of the negative pole (kathode) of a polarizing current is increased; while all irritations lying to the side of the positive pole (anode) have their action diminished.

When, however, this author used stronger currents he obtained the Eckhard results.

Pflüger repeated his irritations, alternately with and without polarization, sixty or more times a minute. This is certainly too often to obtain accurate results, as under these circumstances I have a number of times observed that the *effects* of the removal of the previous irritation overlap into the time of the succeeding irritation. His results were obtained on frogs taken in winter, spring, and summer, and in both varieties of the *Rana esculenta*, and in diseased as well as in healthy frogs.

When this investigator used polarizing currents of greater strength he obtained the results of Valentin and Eckhard. Both the irritations and the polarization were made by means of the albumen electrodes (*i. e.*, non-polarizable electrodes). To obtain the weakest possible currents which would produce muscular contractions, Pflüger made use of the rheochord. In some of his experiments the irritations were made by an interrupted current.

Schiff,* though in a number of experiments he obtained results similar to those obtained by Pflüger, was the first to *experimentally* criticise the theory of this investigator. He states that an experiment which at first corresponded in its results to those obtained by Pflüger, after a half hour gave the very opposite results. He also saw diminished excitability of the nerve produced by the constant current to the side of negative pole (katelectrotonus), and increased excitability occur to the side of the positive pole (anelectrotonus). In one experiment he saw augmented excitability of the nerve both above and below a descending polarizing current and diminished excitability above and below an ascending polarizing current.

Valentin,† in a later work on this subject, found, when very weak currents were employed, an increased excitability to occur to the side of the negative and also to the side of the positive pole of the polarizing current. These experiments were made with the nerve in *situ*, and consequently the non-polarizable electrodes had to be dispensed with.

Nor was Budge‡ more successful in his efforts to convince himself of the constancy of Pflüger's results. This experimenter's polarizing current was derived from 1–2 Daniel cells. His electrodes in some experiments were of amalgamated zinc, but in other experiments platinum and copper electrodes were used, as with these Budge states he obtained the same results as with the former. To test the excitability of the nerves this author resorted to a solution of ordinary salt as an irritant. He

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* Lehrbuch der Nerven und Muskelphysiologie, 1859, p. 94.

† Valentin's paper I was never able to obtain, but was kindly informed of its contents by Professor Schiff.

‡ Virchow's Archiv., Bd. 18, p. 457.; Bd. 28, p. 398.

found that when a solution of salt, just strong enough to produce muscular twitchings, was applied above either a descending or ascending polarizing current, augmented contractions always occurred during the passage of the latter current. When, however, the salt solution was strong enough to produce tetanus, a polarizing current in either direction caused this to cease.

In another series of experiments the irritation was made by the closing of a constant current. When this irritating current was taken so weak as to produce only a trace of contraction in the muscle, the polarizing current on the contrary being very strong, the augmented excitability was only produced by a descend ng irritating current, and the contrary effect was produced by an ascending irritating current. When the polarizing current was of less strength and the irritating current stronger Pflüger's results were obtained.

Fick * used the induced current as an irritant. His results are as follows:

1. A descending irritating current applied to the nerve above an ascending polarizing current caused marked augmentation in the muscular contractions during the passage of the polarizing current.

2. An ascending irritating current applied to the nerve above an ascending polarizing current produced an unimportant augmentation in the muscular contractions during the passage of the latter current.

3. A descending irritating current applied to a nerve above a descending polarizing current produced marked diminution in the muscular contractions during the passage of the latter current.

4. An ascending irritating current applied to the nerve above a descending polarizing current produced not very marked diminution in the muscular contractions during the passage of the latter current.

From these results Fick concludes, against Pflüger, that, with moderately strong induced currents, the exciting impulse does originate in the region of the negative electrode, and that, with a very strong polarizing current the whole intrapolar portion of the nerve is put into a state of anelectrotonus.

In descending katelectrotonus Munk † found the excitability of the nerve increased for the descending and diminished for the ascending irritating current, but immediately after electronizing the nerve the reverse effect was obtained. In weak ascending anelectrotonus the muscular-contraction-exciting properties of the descending irritating current were increased, diminished for the ascending, while the opposite effect was obtained when the polarizing current was stronger. In weak ascending kate- and anelectrotonus the excitability was increased for currents traveling in the same direction. By polarization with stronger currents the excitability was increased for irritating currents traveling

* Beiträge zur Phys. des Elektrotonus, Vierteljahrschr. der Züricher Naturforsch. Gesellschaft, 1866, p. 48.

† Unters. zu allgem. Nervenphys. Arch. für Anat. und Phys., 1866, p. 369.

in either direction. For the intrapolar portion of the nerve the excitability was increased for irritating currents traveling in the same direction as the polarizing current, and decreased for currents traveling in the reverse direction, provided weak polarizing currents were employed. But when these currents were stronger the excitability of the nerve was decreased to irritating currents traveling in either direction.

Schiff and Herzen* publish a number of characteristic experiments which give results also widely differing from those obtained by Pflüger. These authors observed that if the polarizing current excites the nerve, after a lapse of time the opposite effect was obtained; and, *vice versa*, if the polarizing current "paretically" affected the nerve this could after a time be replaced by an augmentation of the excitability.

Notwithstanding so many of the best experimenters found it impossible to confirm the results of Pflüger, these results are now formulated in the books as *laws*. All other investigations are simply ignored and those of Pflüger adopted, it may be, because no other investigator has advanced a more beautiful theory which can be made to correspond to what is known of the electro-motor properties of the nerves. Even Wundt† was convinced of the truth of Pflüger's theory, though it appears that the results which he obtained by no means correspond with those of Pflüger, for on pages 34 and 35 of his "Untersuchungen" he speaks of an increased irritability between the anode and the muscle where an ascending current was used, which, according to Pflüger's theory (it demanding a diminished irritability under these circumstances), is an impossibility.

This was the state of the subject when early in September, 1876, Professor Schiff drew my attention to it, since which time I have constantly had it under consideration. The subject was so discouraging that I frequently felt like giving it up in disgust, but, urged on by Professor Schiff, I continued the study, and a definite explanation of the contradictory facts was arrived at late in December, 1876. Up to that time I had made almost two hundred successful experiments on the subject. The results then arrived at were presented in a preliminary communication in the February (1877) number of the *Archives de sciences phys. et naturelles*, as follows: "*The difference in the effect of an irritation of a polarized nerve, compared to that of a non-polarized nerve, does not solely depend on the circumstance that the portion irritated is to the side of the anode or to the side of the kathode, but much more on the proportion which exists between the strengths of the irritating and polarizing currents.*"

This conclusion my later experiments have abundantly confirmed, and in this paper it is designed not only to expose the results of these later experiments, but also to give *in extenso* the experiments which caused me to come to the foregoing conclusion. It may be thought that this is a

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* Ueber die Veränder. der Erregbarkeit in dem dursch schwache constante Ströme polaris. Nerven, Moleschott's Untersuch., Bd. x, p. 432.

† I must here express my thankfulness for the kind assistance of M. Darier in a number of these experiments.

waste of "printer's ink," but when it is recollected that the Pflüger laws of electrotonus are universally adopted by electro-therapeutists, it will be seen that such an innovation as I propose to make in this branch of physiology must be substantiated by solid facts. As will be shown either in this work or in a paper to appear later, the facts here presented are not only of importance in this connection, but really derive their greatest importance from their affording us a long-sought-for means of explaining the symptoms produced by certain previously occult changes in the central nervous system.

THE EXPERIMENTS OF THE AUTHOR.

The method and apparatus employed.—The *irritations* were made by means of 1–4 small Daniel elements, the strength of which was reduced so as to produce a minimal contraction, by means of a rheochord comprising 3,199 centimetres of silver wire. A Valentin hammer or "key," introduced to make the connection of the current, was so placed as to always fall from the same height. This is absolutely necessary in all these experiments, as the height from which the hammer falls greatly influences the height or strength of the contractions by affecting the strength of the passing current.

The *polarizing current* was derived from 1–2 Daniel elements, and was also in connection with a smaller rheochord, 58 centimetres in length.

The *electrodes* employed for both polarization and irritation were Du Bois Reymond's "Zinc-clay non-polarizable electrodes," which, as Pflüger will no doubt concede, are less objectionable than the albumen electrodes which he employed.

The frog preparations and the electrodes were brought into a *moist-chamber*, where all the irritations were made.

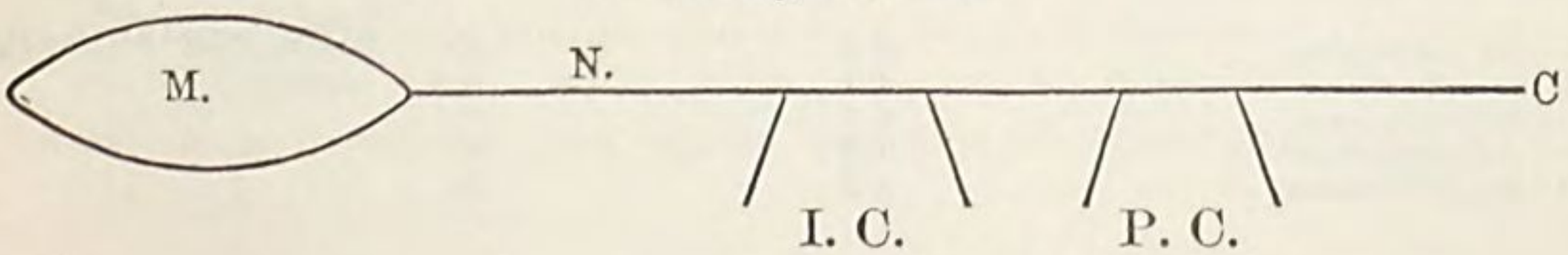
The use of a *myographion*—especially with a weight attached, as it seems Pflüger used it—had to be *dispensed with* in the first series of experiments, as my object was to obtain minimal contractions, which cannot be obtained with a myographion as these contractions are too feeble to raise or move the lever of this instrument.

The *distance between* the two irritating *electrodes* was 4–6^{mm}, which was also the distance between the polarizing poles. The distance between the two currents varied from 5-11^{mm}.

The *frogs* employed had been in captivity but a short time and were largely of the *temporaria* variety.

These experiments were especially guarded against the errors arising from the occurrence of "*secondary polarization*," and from *umpolar excitations*.

A descending polarizing current applied to a nerve above a descending irritating current.



Under these circumstances, if Pflüger's theory be true, the constant polarizing current must *always* cause the irritation to produce a stronger muscular contraction than when it is absent.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**1.**			Rana temporaria.
	1st irritations...	Movements very slight	Movements more marked.	4 cells for polarization; 2 for irritation.
	2d irritations....	.....do	.....do	4 cells for polarization; 1 for irritation.
	3d irritations....	Movements less than before.	.....do	Do.
	4th irritations...	Very slight movements	.....do	Do.
	5th irritations ..	.....do	.....do	Do.
	6th irritations...	.....do	.....do	Do.

In this, as in following experiments, the effect of the opening of the irritating was not noted, while that of closing alone was observed. During the polarization not only were the movements more marked, but they extended over a greater portion of the limb. It may be here remarked, what was forgotten when speaking of the "methods" of experimentation, that in these experiments the sciatic nerve of frogs was used.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**2.**	2 cells, rheochord:		Rana temporaria.
	1st irritations...	2781 cent.....2.	0.	Polarization with 2 Daniel cells.
	2d irritations....	1214 cent.....1.	0. 5	
	3d irritations ...	1318 cent.....1.	1.	
	4th irritations...	1.	1.	
	5th irritations...	1009 cent.....1. 5	1.	
	6th irritations...	2.	0. 5	
	3.			Rana temporaria.
	1st irritations...	2.	2.	Irritation (2 cells), 3109 cent.; polarization, 2 cells.
	2d irritations....	1.	3.	Irritation (2 cells), 3053 cent.; polarization, 2 cells.
	3d irritations....	1.	1.	Irritation (2 cells), 3045 cent.; polarization, 2 cells.
	4th irritations...	1.	1.	Do.
	5th irritations...	1. 5	3.	Irritation (2 cells), 3003 cent.; polarization, 2 cells.
	6th irritations...	1.	3.	
	7th irritations...	1.	3.	Time of experiment, 22 minutes.
	4.			Rana temporaria.
	1st irritations...	0.	2. 5	Polarization, 4 Daniel cells; irritation, 2 cells.
	2d irritations....	0.	2. 5	
	3d irritations....	0.	3.	
	5.			Rana temporaria.
10 15	1st irritations...	1.	0.	Polarization, 4 Daniels; irritation, 2 Daniels.
24	2d irritations....	2.	0. 5	
42	3d irritations....	1. 5	2.	Polarization, 1 Daniel.
11 01	4th irritations...	1. 5	2.	
	6.			Rana temporaria.
12 04	1st irritations...	0. 5	0.	Polarization, 4 Daniels; irritation, 2.
10	2d irritations....	0. 5	0. 5	
15	3d irritations ...	0. 5	0.	
19	4th irritations...	0. 5	0.	
22	5th irritations...	0. 5	0.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	7.			Rana temporaria.
h. m.				
3 06	1st irritations...	0.5	4.	Polarization with 1 Daniel.
08	2d irritations....	0.5	4.	
19	3d irritations....	0.5	4.	
4 09	4th irritations...	0.5	0.5	
	8.			Rana temporaria.
9 58	1st irritations...	0.5	4.	Polarization, 1 Daniel.
10 02	2d irritations....	0.5	0.5	Diminished irritating current.
03¾	3d irritations ..	0.5	0.	
05	4th irritations...	0.5	0.	
07	5th irritations...	0.5	0.	
	9.			Rana temporaria.
10 35	1st irritations...	1.	0.	Polarization, 4 Daniels.
36	2d irritations....	1.	0.	
38	3d irritations....	1.	4.	Polarization, 2 Daniels.
43	4th irritations...	1.	0.5	Polarization, 3 Daniels.
44	5th irritations...	1.	0.5	
45	6th irritations...	1.	0.5	
48	7th irritations...	1.	0.5	
53	8th irritations...	1.	1.	
58	9th irritations ..	1.	0.5	
11 06	10th irritations..	1.	1.	
	10.			Rana temporaria.
11 10	1st irritations...	1.	1.	Polarization, 4 Daniels.
22	2d irritations....	1.	0.5	
	11.			Rana temporaria.
11 40	1st irritations...	1.	4.	Polarization, 4 Daniels.
47	2d irritations....	1.	0.5	Polarization, 3 Daniels.
49	3d irritations....	1.	0.5	
	12.			Rana esculenta.
2 09	1st irritations...	1.	3.5	Weak irritating currents.
10	2d irritations....	1.	3.5	Do.
13	3d irritations....	1.	3.5	Do.
17	4th irritations ..	3.	3.	Strong irritating currents.
23	5th irritations...	3.	2.	Do.
25	6th irritations...	3.	2.	Do.
	13.			Rana temporaria.
2 35	1st irritations...	1.	3.	Rheochord (irrit.), 2458 cent.
42	2d irritations....	1.	0.5	Rheochord (irrit.), 2350 cent.
45	3d irritations....	1.	0.	Do.
48	4th irritations...	1.	0.	Do.
52	5th irritations...	1.	0.	Rheochord (irrit.), 2127 cent.
	14.			Rana esculenta.
3 27	1st irritations...	0.2	5.	Rheochord (irrit.), 2907 cent.
29	2d irritations....	0.2	5.	Do.
32	3d irritations....	2.5	1.	Rheochord (irrit.), 1793 cent.
35	4th irritations...	1.	5.	Rheochord (irrit.), 2781 cent.
40	5th irritations...	1.	5.	Do.
	15.			Rana esculenta.
4 02	1st irritations...	0.2	0.5	Rheochord (irrit.), 3058 cent.
06	2d irritations....	0.2	0.2	Rheochord (irrit.), 2562 cent.
10	3d irritations ...	0.5	0.2	Rheochord (irrit.), 2249 cent.
13	4th irritations...	0.5	0.2	
16	5th irritations...	0.5	0.5	
20	6th irritations...	0.5	0.5	
30	7th irritations...	0.5	0.5	
35	8th irritations...	0.5	0.5	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	16.			
h. m.		Rheochord:		Rana temporaria.
11 15	1st irritations...	2781 cent.....0.	0.	
20	2d irritations....	2675 cent.....0. 5	3. 5	
23	3d irritations ...	2675 cent.....1. 5	2.	
25	4th irritations...	2458 cent.....1. 5	1.	
30	5th irritations...	223 cent.....3.	0. 5	
32	6th irritations...	223 cent .....3.	0. 5	
39	7th irritations ..	223 cent .....3.	0. 5	
43	8th irritations...	1634 cent.....1. 5	1.	
45	9th irritations ..	2127 cent 0. 5	2.	
47	10th irritations..	2127 cent 0. 5	2.	
47½	11th irritations..	1413 cent.....0. 5	2.	
48	12th irritations..	1109 cent 0. 5	2.	
49	13th irritations ..	223 cent .....1.	4.	
53	14th irritations..	223 cent .....0.	4.	
54	15th irritations..	223 cent.....0. 5	4.	
56	16th irritations..	223 cent 0. 5	4.	
	17.			
		Rheochord:		Rana esculenta.
10 46	1st irritations ...	1893 cent.....1. 5	0.	
54½	2d irritations....	2016 cent.....1. 5	5.	
57	3d irritations ...	223 cent .....2.	4.	
58	4th irritations...	1893 cent .....0.	4.	
59	5th irritations...	1713 cent.....0.	4.	
59½	6th irritations...	1634 cent.....0.	3.	
11 00½	7th irritations...	1526 cent.....0.	3.	
01	8th irritations ..	1413 cent.....0.	3.	
02	9th irritations...	1308 cent.....0.	3.	
02½	10th irritations..	691 cent.....0.	3.	
06	11th irritations..	488 cent.....0.	3.	
09	12th irritations..	223 cent.....0.	3.	
10	13th irritations..	223 cent.....0.	3.	
15	14th irritations..	223 cent .....0.	3.	
	18.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
9 45	1st irritations ...	2955 cent.....1.	0.	
49	2d irritations....	2955 cent.....1.	0.	
50	3d irritations ...	2955 cent.....0. 5	0.	
60	4th irritations ..	2955 cent.....0.	0.	
10 02	5th irritations...	2955 cent .....0.	0.	
05	6th irritations...	2401 cent.....4.	4.	
07	7th irritations...	2728 cent .....4.	1.	
09	8th irritations...	2728 cent .... 4.	1.	
12	9th irritations ..	2728 cent.....0.	0.	
16	10th irritations..	223 cent.....4.	4.	
20	11th irritations..	2728 cent .....2.	0. 5	
22	12th irritations..	2728 cent.....2.	0. 5	
28	13th irritations..	2728 cent .....2.	0. 5	
34	14th irritations..	2728 cent .... 2.	0. 5	
40	15th irritations..	2728 cent.....1. 5	0.	
43	16th irritations..	2728 cent.....1. 5	0. 5	
	19.			
		1 cell, rheochord:		Rana temporaria.
1 32	1st irritations ...	223 cent .. ..5.	4.	
39	2d irritations....	223 cent.....0.	4.	
50	3d irritations....	223 cent .....0.	4.	
	20.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
2 10	1st irritations ...	3109 cent .....0.	0.	
15	2d irritations....	3179 cent.....0.	4.	
19	3d irritations....	3198 cent .....0.	4.	
21	4th irritations ..	223 cent.....3.	3.	
22	5th irritations ..	3198 cent .....0.	0.	
36	6th irritations...	3198 cent.....0.	0.	
45	7th irritations...	3198 cent.....0.	0.	
47	8th irritations ..	2849 cent.....2.	0.	
49	9th irritations ..	2295 cent .... 2.	2.	
50	10th irritations..	223 cent.....2.	2.	
3 05	11th irritations..	3058 cent.....0.	0.	
06	12th irritations..	3164 cent.....0.	0.	
14	13th irritations..	3164 cent.....0.	0.	
15	14th irritations ..	223 cent.....1. 5	3.	
35	15th irritations..	223 cent.....1.	1.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	21.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta.
h. m.				
3 20	1st irritations ...	3109 cent.....0.	0.	
23	2d irritations....	1847 cent .....3.	0.	
24	3d irritations	1413 cent.....4.	1.	
27	4th irritations ..	223 cent .....5.	5.	
	22.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
9 00	1st irritations ..	3197 cent.....0.	3.	
12	2d irritations....	3197 cent.....0.	4.	
23	3d irritations....	3197 cent.....0.	3.	
29	4th irritations ..	3197 cent.....0.	2.	
30	5th irritations ..	223 cent.....0.	3.	
31	6th irritations ..	3109 cent.....0.	3.	
37	7th irritations ...	1 cell .....5.	5.	
45	8th irritations ...	1 cell ..... 0.	3.	
56	9th irritations ...	1 cell .....3.	5.	
10 08	10th irritations...	1 cell .....2.	2.	
18	11th irritations ..	1 cell .....4.	3.	
25	12th irritations ..	1 cell .....4.	2.	
30	13th irritations ..	1580 cent .... 4.	0.	
35	14th irritations ..	2728 cent .... 0.	0.	
40	15th irritations ..	2728 cent .... 1.	2.	
45	16th irritations ..	2728 cent.....1.	2.	
50	17th irritations ..	2728 cent.....1.	2.	
55	18th irritations ..	2728 cent.....1.	4.	
11 00	19th irritations ..	2728 cent .... 1.	3.	
21	20th irritations ..	2728 cent .... 3.	1.	
26	21st irritations ..	2728 cent.....4.	2.	
31	22d irritations ..	2728 cent.....4.	0.	
36	23d irritations ..	2728 cent.....3.	0. 5	
41	24th irritations ..	2728 cent .... 3.	0. 5	
53	25th irritations ..	2849 cent.....5.	0.	
58	26th irritations ..	2849 cent.....1.	0.	
12. 00	27th irritations ..	2849 cent.....1.	0.	
06	28th irritations ..	2849 cent.....3.	0.	
	23.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
2 00	1st irritations ..	3197 cent.....0.	0.	
05	2d irritations....	3197 cent .....0.	0.	
3 03	3d irritations....	223 cent .... 5.	4.	
09	4th irritations ..	1793 cent ... 4.	2.	
14	5th irritations...	1793 cent.....4.	0.	
16	6th irritations...	2510 cent.....3.	0.	
21	7th irritations ..	2510 cent.....4.	0.	
26	8th irritations ...	2510 cent.....2.	0.	
42	9th irritations ..	2510 cent.....2. 5	1. 5	
	24.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
8 54	1st irritations ..	3109 cent..... 0.	0.	
9 06	2d irritations	2183 cent.....3.	0.	
10	3d irritations	2183 cent.....0.	0.	
14	4th irritations ..	2016 cent.....2.	1.	
25	5th irritations...	1360 cent.....3.	3.	
30	6th irritations ..	1360 cent.....1.	1.	
36	7th irritations ..	1360 cent.....0. 5	0. 5	
40	8th irritations ..	1360 cent 0. 5	0. 5	
	25.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
10 14	1st irritations ..	3197 cent .... 0.	5.	
17	2d irritations....	3197 cent.....0.	5.	
21	3d irritations ..	3197 cent .....0.	5.	
25	4th irritations ..	3058 cent .....0.	5.	
26	5th irritations ..	3003 cent.....5.	5.	
29	6th irritations ..	3003 cent.....5.	5.	
36	7th irritations ..	3003 cent.....4.	5.	
41	8th irritations...	3003 cent .... 3.	5.	
46	9th irritations...	3058 cent.....0.	5.	
50	10th irritations..	3058 cent.....0.	5.	
52	11th irritations..	2955 cent.....2.	5.	
54	12th irritations..	2955 cent .. ..2.	5.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
57	13th irritations..	2955 cent.....2.	5.	
11 04	14th irritations..	2955 cent.....1.	5.	
07	15th irritations..	2955 cent.....0.	5.	
11	16th irritations..	2955 cent.....0.	4.	
21	17th irritations..	2955 cent.....0.	5.	
	26.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana esculenta.
9 27	1st irritations...	3197 cent.....0.	5.	
32	2d irritations....	3197 cent .....0.	5.	
37	3d irritations....	3197 cent.....0.	5.	
41	4th irritations...	3058 cent..... 1.	5.	
50	5th irritations...	3058 cent .....2.	4.	
55	6th irritations...	3058 cent.....0.	4.	
10 03	7th irritations...	3058 cent.....0. 5	3.	
08	8th irritations ..	3058 cent.....0. 5	4.	
13	9th irritations...	3058 cent.....1.	4.	
16	10th irritations..	3058 cent.....0.	4.	
20	11th irritations..	2955 cent.....2.	0. 5	
22	12th irritations..	2849 cent.....2.	1.	
24	13th irritations..	2728 cent.....4.	2.	
27	14th irritations..	2728 cent.....3.	0.	
29	15th irritations..	2350 cent.....4.	2.	
32	16th irritations..	2350 cent .....4.	1.	
33	17th irritations..	223 cent.....5.	5.	
35	18th irritations..	2350 cent.....4.	1.	
11 32	19th irritations..	2562 cent.....4.	5.	
33	20th irritations..	2562 cent.....4.	5.	
34	21st irritations..	2849 cent..... 2.	5.	
35	22d irritations...	2955 cent.....0. 5	5.	
37	23d irritations ..	2955 cent.. .. 0.	5.	
38	24th irritations..	2901 cent..... 2.	5.	
39	25th irritations..	2901 cent.....3.	5.	
42	26th irritations..	3003 cent.....2.	1.	
44	27th irritations..	3003 cent.....3.	1.	
50	28th irritations..	3003 cent.....0. 5	5.	But 1 polarizing cell.
51	29th irritations..	3003 cent.....4.	0.	4 polarizing cells.
52	30th irritations..	3003 cent.....5.	0. 5	Do.
53	31st irritations..	3003 cent.....5.	2.	Do.
56	32d irritations ..	3003 cent..... 5.	2.	Do.
	27.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana esculenta. Other leg of last frog.
11 12	1st irritations...	2781 cent.....0.	5.	
15	2d irritations...	2675 cent.....0. 5	5.	
30	3d irritations ...	2675 cent.....0.	5.	
31	4th irritations...	2562 cent..... 2.	5.	
32	5th irritations...	2562 cent..... 1.	5.	
40	6th irritations...	3058 cent.....0.	5.	
41	7th irritations ..	3003 cent.....1.	5.	
46	8th irritations ..	3003 cent .....2.	4.	
48	9th irritations...	3003 cent.....2.	4.	
53	10th irritations..	3003 cent.....0.	5.	
54	11th irritations..	3003 cent.....0.	4.	
55	12th irritations..	3003 cent.....0.	4.	
	28.	Irritation, 1 cell, rheochord:	Polarization, 4 cells.	Rana temporaria.
1 56	1st irritations...	3109 cent.....1.	4.	
58	2d irritations....	3109 cent 0. 5	4.	Polarization, 1 cell.
59	3d irritations....	3179 cent.....0.	4.	Do.
2 00	4th irritations...	3179 cent.....0.	4.	Polarization, 4 cells.
05	5th irritations...	3179 cent.....0.	4.	Do.
06	6th irritations...	3179 cent.....0.	2.	Polarization, 1 cell.
10	7th irritations ..	3003 cent .... 1.	3.	Do.
12	8th irritations...	3003 cent.. .. 2.	4,	Polarization, 4 cells.
27	9th irritations ..	3003 cent.....0. 5	5.	Do.
29	10th irritations..	3003 cent.....0. 5	5.	Polarization, 1 cell.
33	11th irritations..	3003 cent.....0. 5	5.	Do.
34	12th irritations..	3003 cent.....0.	4.	Polarization, 4 cells.
40	13th irritations..	3003 cent.....3.	4.	Do.
43	14th irritations..	3003 cent .....2.	4.	Polarization, 1 cell.
45	15th irritations..	1160 cent .....4.	5.	Do.
46	16th irritations..	1160 cent.....4.	5.	Polarization, 4 cells.
46½	17th irritations..	341 cent..... 4.	4.	Do.
47½	18th irritations..	341 cent.....4.	4.	Polarization, 1 cell.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
2 48	19th irritations..	3003 cent.....1.	0.	Polarization, 1 cell.
49	20th irritations..	3003 cent.....1. 5	3.	Polarization, 4 cells.
52	21st irritations..	3003 cent..... 0. 5	4.	Do.
53	22d irritations...	3003 cent.....0. 5	0.	Polarization, 1 cell.
54	23d irritations...	3003 cent.....4.	4.	Do.
55	24th irritations..	3003 cent.....4.	4.	Polarization, 4 cells.
58	25th irritations..	2955 cent.....0. 5	0.	Polarization, 1 cell.
3 00	26th irritations..	691 cent.....4. 5	5.	Polarization, 4 cells.
01	27th irritations..	691 cent.....4. 5	5.	Polarization, 1 cell.
02	28th irritations..	2781 cent.....1.	3.	Do.
16	29th irritations..	2675 cent.....3.	0.	Polarization, 4 cells.
18	30th irritations..	2675 cent.....2.	1.	Polarization, 1 cell.
	29.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
11 29	1st irritations...	3197 cent.....2.	55 cent.....5.	Polarization current from 1 cell.
31	2d irritations....	3197 cent.....2.	55 cent.....5.	Do.
33	3d irritations ...	3176 cent.....0.	57 cent.....3.	Do.
45	4th irritations...	3176 cent.....0.	53 cent.....2.	Do.
50	5th irritations...	3176 cent.....0.	56 cent.....1.	Do.
55	6th irritations...	3176 cent.....0. 5	56 cent.....1.	Do.
	30.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
9 29	1st irritations...	3013 cent.....0.	57 cent..... 1. 5	
35	2d irritations ...	2925 cent.....0.	57 cent.....3.	
36	3d irritations....	2925 cent.....0.	38 cent ..... 4.	
37	4th irritations...	2925 cent.....2.	38 cent.....5.	
58	5th irritations...	2875 cent.....0.	48 cent.....2.	
10 01	6th irritations...	2849 cent.....0.	38 cent.....1.	
	31.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
9 00	1st irritations...	223 cent..... 0. 5	10 cent.....1.	
05	2d irritations....	223 cent.....0.	10 cent.....1.	
10	3d irritations....	223 cent..... 0. 5	10 cent.....1.	
	32.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
9 20	1st irritations...	3109 cent.....1.	48 cent.....1.	
9 30	2d irritations ...	3025 cent ..... 2.	30 cent .....3.	
31	3d irritations ...	3025 cent.....1.	30 cent.....2.	
38	4th irritations...	3025 cent.....0. 5	30 cent ..... 2.	
43	5th irritations ..	3025 cent ..... 2.	30 cent.....5.	
45	6th irritations ..	2955 cent.....2.	30 cent.....2.	
48	7th irritations...	2955 cent.....3.	30 cent .....2.	
49	8th irritations...	2555 cent.....3.	30 cent.....3.	
52	9th irritations ..	2955 cent.....2.	30 cent .....5.	
55	10th irritations..	2955 cent ..... 2.	30 cent.....2.	
10 00	11th irritations..	2781 cent.....4.	30 cent .....5.	
02	12th irritations..	2781 cent.....5.	30 cent .....5.	
06	13th irritations..	2875 cent.....3.	30 cent .....4.	
07	14th irritations..	2875 cent.....3.	30 cent.....3.	
08	15th irritations..	2875 cent.....1.	30 cent.....3.	
10	16th irritations..	2875 cent.....0.	30 cent .....0.	
12	17th irritations..	2728 cent.....2.	30 cent ..... 5.	
13	18th irritations..	2728 cent.....4.	30 cent.....4.	
14	19th irritations..	2728 cent.....3. 5	30 cent.....4.	
16	20th irritations..	2728 cent.....4.	30 cent.....4. 5	
18	21st irritations ..	2728 cent.....3. 5	49 cent..... 3. 5	
19	22d irritations...	2728 cent.....3.	49 cent..... 3.	
22	23d irritations...	2728 cent.....0. 5	49 cent.....2.	
35	24th irritations..	2675 cent ..... 5.	49 cent .....5.	
37	25th irritations..	2700 cent ..... 3.	49 cent.....3.	
40	26th irritations..	2700 cent.....3.	49 cent.....3.	
44	27th irritations..	2700 cent.....3.	49 cent..... 4.	
47	28th irritations..	2700 cent.....3.	49 cent.....4.	
50	29th irritations..	2700 cent.....4.	49 cent.....4.	
52	30th irritations..	2700 cent.....2.	49 cent.....3.	
57	31st irritations ..	2700 cent ..... 2.	49 cent.....3.	
58	32d irritations...	2700 cent.....2. 5	49 cent.....3.	
11 01	33d irritations...	2700 cent ..... 2.	49 cent.....2. 5	
04	34th irritation...	2700 cent.....3.	49 cent .....4.	
14	35th irritations..	2700 cent.....4.	49 cent 4. 5	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	33.			
h. m.		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
1 20	1st irritations...	2781 cent.....3. 5	49 cent.....4.	
21	2d irritations....	2901 cent.....3.	49 cent.....4.	
22½	3d irritations....	2901 cent.....2. 5	10 cent.....4.	
24	4th irritations...	2901 cent.....2.	10 cent.....4.	
40	5th irritations...	2901 cent.....2.	10 cent.....3.	
47	6th irritations...	2675 cent.....2.	10 cent..... 3.	
2 01	7th irritations...	2675 cent.....2.	10 cent.....3.	
04	8th irritations..	2675 cent .... 2.	10 cent ..... 3.	
08	9th irritations...	2675 cent .....2.	10 cent.....2.	
10	10th irritations..	2675 cent.....2.	10 cent.....3.	
11	11th irritations..	2675 cent.....2. 5	30 cent.....3.	
16	12th irritations..	2675 cent.....2.	30 cent .....3.	
18	13th irritations..	2675 cent .... 1.	30 cent .....3.	
24	14th irritations ..	2675 cent.....1.	30 cent.... .. 2.	
27	15th irritations..	2562 cent .... 1.	30 cent.... .. 2.	
28	16th irritations..	2562 cent.....2.	30 cent.....2.	
30	17th irritations..	2562 cent .... 2.	30 cent.....2.	
31	18th irritations..	2562 cent .... 2.	30 cent ..... 2.	
34	19th irritations..	2562 cent.....2.	30 cent.... .. 2.	
38	20th irritations..	2016 cent.....2.	30 cent 2. 5	
41	21st irritations ..	2016 cent.....2.	30 cent.....2. 5	
42	22d irritations...	2016 cent.....2.	30 cent.....2.	
44	23d irritations...	2127 cent .... 2.	30 cent 2. 5	
45	24th irritations ..	2127 cent.....2.	30 cent.....2.	
50	25th irritations .	2127 cent.....1. 5	30 cent ..... 2.	
52	26th irritations..	2127 cent.....1.	30 cent.. .....2.	
	34.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
9 39	1st irritations...	3169 cent.....1.	10 cent.....2.	
40	2d irritations....	3169 cent.....0. 5	30 cent.....1. 5	
44	3d irritations....	3169 cent.....0. 5	30 cent..... 0. 5	
46	4th irritations...	3189 cent.....0. 5	30 cent.....1.	
	35.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Other leg of last frog.
10 06	1st irritations ..	2781 cent 1. 5	10 cent.....2.	
10	2d irritations ..	2781 cent.....0. 5	10 cent.....1. 5	
12	3d irritations ...	2781 cent.....0. 5	10 cent.....0. 5	
14	4th irritations...	2781 cent .....1.	10 cent .....1.	
17	5th irritations ..	2781 cent.....0. 5	30 cent.... 1.	
20	6th irritations ..	2781 cent.....0. 5	30 cent.....0. 5	
35	7th irritations...	1526 cent.....0. 5	30 cent.....1.	

In the preceding experiments the muscular contractions caused by the *closing* of the circuit were used to measure the excitability of the nerves, and are represented by the figures in columns 3 and 4. Of these figures 5 represents maximal and 0.5 minimal contractions.

Out of the thirty-five experiments just given, but nine (experiments 1, 4, 7, 14, 17, 27, 29, 30, and 31) go to confirm the theory of Pflüger, while fourteen (experiments 2, 6, 8, 9, 10, 11, 13, 15, 16, 18, 21, 22, 23, and 24) give results in direct opposition with it. Of the remaining twelve experiments, in two (5 and 12) an increased excitability of the nerve was produced by the polarizing current in one-half the irritations. In ten experiments (3, 19, 20, 25, 26, 28, 32, 33, 34, and 35) Pflüger's result was usually obtained.

From this we must conclude that Pflüger's theory does not hold good as regards the effect of a descending polarizing current on the excitability of the nerves, as measured by means of the muscular contractions produced by the closing of an electric circuit.

In the following experiments the muscular contractions noted were produced by the *opening* of the circuit.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**36.**	Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
	1st irritations ...	2900 cent.....2.	0.	
	2d irritations....	2695 cent .... 2.	0.	
	3d irritations ..	2770 cent .... 2.	0. 5	
	4th irritations ...	1526 cent .... 2.	0. 5	
	5th irritations ..	1308 cent.....0. 5	0. 5	
	6th irritations ..	1000 cent.....0. 5	0. 5	
	37.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
	1st irritations ...	3.	3.	
	2d irritations....	3.	3.	
	3d irritations ...	3109 cent.....0 5	3.	
	4th irritations...	3109 cent 0. 5	3.	
	5th irritations...	3109 cent.....0. 5	0.	
	38.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
2 46	1st irritations ...	3109 cent 0. 5	0. 5	
3 05	2d irritations ...	3109 cent.....0. 5	2.	
13	3d irritations....	3109 cent .... 2.	2.	
17	4th irritations...	3109 cent 0. 5	2.	
25	5th irritations...	3003 cent 0. 5	2.	
30	6th irritations...	3003 cent.....0. 5	2.	
35	7th irritations...	3003 cent.....0. 5	2.	
	39.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta.
11 20	1st irritations ...	2675 cent.....0.	2.	
25	2d irritations....	2675 cent.....0.	0.	
32	3d irritations	223 cent.....1.	0. 5	
39	4th irritations...	223 cent.....1.	0.	
43	5th irritations...	1634 cent.....1.	0.	
	40.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
1 05	1st irritations ...	2458 cent .....1.	0.	
12	2d irritations....	2350 cent.....1. 5	0.	
15	3d irritations....	2350 cent.....1. 5	0.	
20	4th irritations...	2350 cent.....1. 5	0.	
	41.	Irritation, 1 cell:	Polarization, 4 cells:	
1 45	1st irritations ...	3109 cent.....0. 5	1.	
46	2d irritations....	3109 cent.....0. 5	4.	
47	3d irritations ...	3109 cent.....0.	3.	
49	4th irritations...	3109 cent.....0.	5.	
	42.	Irritation, 1 cell:	Polarization, 3 cells:	Rana temporaria.
12 00	1st irritations ...	0.	3.	
04	2d irritations....	0.	3.	
08	3d irritations....	0.	3.	
	43.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana esculenta.
2 00	1st irritations ...	2562 cent.....1.	3.	
04	2d irritations....	2249 cent.....1. 5	0. 5	
08	3d irritations....	2249 cent.....1. 5	0. 5	
11	4th irritations...	2249 cent.....1. 5	0.	
14	5th irritations..	2249 cent.....1. 5	0.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	44.			
h. m.		Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana esculenta.
4 07	1st irritation ...	3189 cent.....0.5	3.	
09	2d irritations....	3189 cent 0.5	2.5	
13	3d irritations....	3189 cent.....0.5	2.5	
	45.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
5 00	1st irritations ...	0.5	3.	
07	2d irritations ...	0.5	0.	
09	3d irritations ...	0.5	0.	
	46.			
		Irritation, 1 cell:	Polarization, 4 cells:	
11 03	1st irritations ...	1.	0.	
05	2d irritations ...	1.	0.	
08	3d irritations....	1.	5.	Polarization, 2 cells.
14	4th irritations...	1.	0.5	Polarization, 4 cells.
15	5th irritations...	1.	0.5	
16	6th irritations...	1.	0.	
18	7th irritations ..	2.	0.5	
23	8th irritations...	1.	0.5	
28	9th irritations...	1.	0.5	
12 06	10th irritations..	0.5	0.5	
	47.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana esculenta.
9 05	1st irritations ...	1.	0.	
12	2d irritations....	1.	0.	
14	3d irritations....	0.5	0.	
15	4th irritations...	0.5	0.	
17	5th irritations...	0.5	0.	
	48.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
2 56	1st irritations ...	1.	3.	
59	2d irritations....	1.	3.	
3 01	3d irritations ...	1.	3.	
43	4th irritations...	0.5	0.5	
	49.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
2 09	1st irritations ...	1.	0.	
12	2d irritations ...	1.	0.	
22	3d irritations....	2.	0.5	
	50.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
8 00	1st irritations ..	1.	0.5	
06	2d irritations ...	1.	0.	
11	3d irritations....	1.	0.5	
	51.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta.
8 29	1st irritations ...	223 cent.....1.5	0.	
32	2d irritations ..	223 cent.....0.	0.	
34	3d irritations....	223 cent 1.5	0.	
38	4th irritations ..	223 cent.....1.5	0.	
	52.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
9 45	1st irritations ...	2955 cent.....1.	0.5	
47	2d irritations....	2955 cent.....1.	3.	Polarization, 1 cell.
50	3d irritations ...	2955 cent.....1.	0.5	
10 00	4th irritations...	2955 cent.....0.5	0.5	
05	5th irritations...	2401 cent.....3.	3.	
09	6th irritations...	2728 cent.....3.	0.5	
12	7th irritations...	2728 cent.....2.5	3.	
16	8th irritations...	223 cent.....4.	4.	
20	9th irritations...	2728 cent..... 2.	0.5	
22	10th irritations..	2728 cent.....2.	3.	
28	11th irritations..	2728 cent.....2.	0.5	
40	12th irritations..	2728 cent..... 1.5	0.	
43	13th irritations..	2728 cent.....1.5	0.	
54	14th irritations..	2728 cent.....1.5	0.5	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	53.			
h. m.		Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
2 10	1st irritations...	3109 cent.....1.5	4 cells.....0.	
15	2d irritations....	3179 cent .....0.	1 cell ....3.	
19	3d irritations ...	223 cent.....3.	4 cells. .....1.	
21	4th irritations...	3198 cent.....0.	1 cell.....3.	
22	5th irritations ..	3198 cent.....0.	1 cell.....3.	
36	6th irritations ..	3198 cent.....0.	1 cell..... 3.	
45	7th irritations ..	2849 cent.....0.	1 cell.....3.	
47	8th irritations...	2295 cent.....0	1 cell.....3.	
49	9th irritations...	223 cent .....3.	1 cell.....3.	
50	10th irritations..	3058 cent .....0.	1 cell..... 3.	
3 05	11th irritations..	3194 cent.....0.	1 cell..... 3.	
06	12th irritations..	3194 cent.....0.	1 cell.....3.	
14	13th irritations..	223 cent 1.5	3.	
15	14th irritations..	223 cent 1.5	3.	
	54.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
2 30	1st irritations...	3197 cent .....3.	0.	
42	2d irritations....	3197 cent.....2.	0.	
52	3d irritations....	3197 cent.....2.	0.	
	55.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
9 05	1st irritations...	3197 cent.....0.	4.	
10	2d irritations....	3197 cent.....0.	5.	
18	3d irritations ...	3197 cent .....0.	4.	
28	4th irritations...	3187 cent.....0.	3.	
40	5th irritations...	3187 cent .... 0.	2.	
45	6th irritations...	3.87 cent.....0.	0. 5	
10 07	7th irritations...	1793 cent.....0.	3.	
09	8th irritations...	223 cent.....0.	0.	
	56.			
		Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
10 29	1st irritations...	3003 cent.....5.	5.	
36	2d irritations....	3003 cent .... 4.	5.	
41	3d irritations ...	3003 cent .....3.	5.	
46	4th irritations...	3058 cent.....0.	5.	
50	5th irritations...	3058 cent.....0.	5.	
52	6th irritations ..	2955 cent .....2.	5.	
54½	7th irritations...	2955 cent.....2.	5.	
57½	8th irritations ..	2955 cent.....0.	5.	
11 05	9th irritations ..	2955 cent.....1.	5.	
07	10th irritations..	2955 cent.....0. 5	5.	
11½	11th irritations..	2955 cent.....0.	5.	
17	12th irritations..	2955 cent.....0.	5.	
21	13th irritations..	2955 cent.....0.	5.	
	57.			
		Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
11 15	1st irritations...	2675 cent.....0.	4 cells .....0.	
31	2d irritations ...	2562 cent .....0.	4 cells.....0.	
46	3d irritations....	2955 cent .....0.	4 cells.....1.	
48	4th irritations ..	2955 cent .....0.	4 cells .....1.	
53	5th irritations ...	2955 cent.....0.	4 cells .....1.	
54	6th irritations...	2955 cent.....0.	1 cell..... .. 0. 5	
55	7th irritations...	2955 cent.....0.	1 cell.....0.	
	58.			
		Irritation, 1 cell:	Polarization:	Rana temporaria.
2 00	1st irritations...	3179 cent.....0.	4 cells.....0.	
05	2d irritations....	3179 cent.....0.	4 cells.....0.	
06	3d irritations....	3179 cent.....0.	1 cell.....2.	
10	4th irritations ..	3003 cent.....0.	1 cell.....4.	
12	5th irritations...	3003 cent.....0.	4 cells.....0.	
40	6th irritations ..	3003 cent .....0.	4 cells..... 0.	
43	7th irritations ..	3003 cent.....0.	1 cell.....4.	
45	8th irritations...	1160 cent .....0.	1 cell.....0.	
46	9th irritations ..	1160 cent .....0.	4 cells.....1.	
46½	10th irritations..	341 cent.....0.	4 cells.....1.	
47½	11th irritations..	341 cent .....0.	1 cell.....1.	
48	12th irritations..	3003 cent.....0.	1 cell .....3.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
2 49	13th irritations..	3003 cent.....0.	4 cells.....0.	
52	14th irritations..	3003 cent.....0.	4 cells..... 0.	
53	15th irritations..	3003 cent.....0.	1 cell.....3.	
54	16th irritations..	3003 cent..... 0.	1 cell .....1.	
55	17th irritations..	3003 cent.....0.	4 cells.....0.	
58	18th irritations..	2955 cent..... 0.	1 cell ..... 2.	
3 00	19th irritations..	691 cent.....0.	4 cells.....0.	
01	20th irritations..	691 cent.....0.	1 cell.....1.	
02	21st irritations..	2781 cent.....0.	1 cell.....0.	
16	22d irritations...	2675 cent.....1.	4 cells.....0.	
18	23d irritations...	2675 cent.....1.	1 cell.....0.	
	59.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
2 19	1st irritations...	3197 cent.....0. 5	3 cent..... 5.	
21	2d irritations ..	3197 cent 0. 5	3 cent..... 5.	
24	3d irritations....	3179 cent.....0.	0 cent.....3.	
34	4th irritations...	3179 cent.....0.	5 cent.....3.	
40	5th irritations...	3179 cent .... 0.	2 cent.....3.	

In the last twenty-four experiments it will be seen that an augmented excitation of the nerve for the breaking of an irritating current to the side of the kathode of a constant current was produced, as a rule, in but ten experiments (38, 42, 48, 53, 55, 56, 57, 58, and 59). A diminished excitability of the nerve occurred under these circumstances in fourteen experiments (36, 37, 39, 40, 41, 43, 45, 46, 47, 49, 50, 51, 52, and 54).

The results obtained in these fifty-nine experments cannot be explained by the theory which demands an increased excitability of the nerve to the side of the kathode of the constant or polarizing current.

In searching for an explanation of these varying results, it occurred to me that the nerves and muscles on which these experiments (as also those of Pflüger) were made could hardly be considered as being in a normal state, in spite of the precautions used. The differences in the results could then be explained by referring them to the changes taking place in a dying nerve or muscle, which changes have been so little studied. To determine whether or not this was the explanation, a series of experiments were made on the uninjured nerve in its normal position. Copper electrodes were covered with wax, except at the point where they touch the nerve and passed underneath this structure, which was then experimented upon. The *making* of the circuit was observed in the following experiments:

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	60.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
h. m.				Whenever the nerve showed signs of becoming dry in any of the following experiments it was moistened with a .015 solution of pure chloride of sodium.
3 06	1st irritations...	3003 cent..... 0.	10 cent ..... 0.	
10	2d irritations ...	3003 cent ..... 0.	55 cent ..... 0.	
15	3d irritations ...	2781 cent.....0.	55 cent..... 4.	
16	4th irritations ..	2781 cent.....0.	10 cent.....1.	
16½	5th irritations ..	2781 cent.....0.	55 cent.....3.	
20	6th irritations...	2781 cent.....0.	55 cent .....0.	
32	7th irritations...	1739 cent.....2.	55 cent .....2.	
34	8th irritations...	1739 cent.....2.	55 cent.....2.	
36	9th irritations...	1739 cent.....2.	10 cent.....2.	
4 00	10th irritations..	1739 cent.....2.	50 cent.....4.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	61.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
h. m.				
4 15	1st irritations...	1951 cent.....0.	50 cent .....0.	
20	2d irritations....	341 cent.....3.	10 cent .....3.	
21	3d irritations....	1214 cent .....2.	50 cent .....5.	
22	4th irritations...	1214 cent 0. 5	10 cent ..... 5.	
23	5th irritations...	1214 cent.....0. 5	10 cent..... 3.	
24	6th irritations...	1214 cent 0. 5	10 cent.....0.	
25	7th irritations...	1214 cent.....0. 5	50 cent.....0.	
50	8th irritations...	2016 cent.....3.	49 cent.....0.	Electrodes brought nearer to each other.
	62.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
11 15	1st irritations ..	1526 cent.....0.	49 cent..... 0.	
53	2d irritations ..	1009 cent .... 1.	49 cent ..... 0.	
54	3d irritations....	888 cent .....0.	49 cent.....0.	
55	4th irritations...	888 cent.....1.	49 cent .....0.	
56	5th irritations...	888 cent.....1.	10 cent ..... 0.	
57	6th irritations...	888 cent.....0.	49 cent.....0.	
58	7th irritations...	888 cent.....0. 5	10 cent.....0.	
	63.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
12 10	1st irritations ..	888 cent 0. 5	10 cent .....3.	
10½	2d irritations ..	888 cent.....0. 5	49 cent.....0. 5	
11	3d irritations ...	888 cent.....0.	49 cent ..... 2.	
11½	4th irritations ..	888 cent .... 0.	10 cent ..... 2.	
15	5th irritations...	888 cent.....0. 5	10 cent.....0.	
16	6th irritations...	888 cent.....1.	49 cent .....0.	
17	7th irritations ..	888 cent.....0. 5	49 cent.....0. 3	
18	8th irritations...	888 cent.....0. 5	10 cent..... 0. 3	
	64.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana esculenta.
10 00	1st irritations ..	2618 cent.....0. 5	10 cent 0. 5	Distance between polarizing and irritating electrodes 2.5 mm.
08	2d irritations....	2618 cent.....0.	54 cent.....4.	
10	3d irritations....	2618 cent .....2.	10 cent..... 3.	
12	4th irritations...	2562 cent.....3.	10 cent.....3.	
14	5th irritations...	2562 cent.....2. 5	10 cent.....3.	
16	6th irritations ..	2678 cent.....0. 5	10 cent 0. 5	
25	7th irritations...	2678 cent.....0. 5	55 cent .....1.	
27	8th irritations...	2678 cent.....0. 5	55 cent.....0. 5	
	65.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana esculenta.
10 40	1st irritations...	2675 cent.....0. 5	54 cent 0. 5	Distance between electrodes 5 mm.
50	2d irritations ...	2618 cent.....0.	52 cent 0. 5	
52	3d irritations	2618 cent.....0.	52 cent.....0. 5	
54	4th irritations ..	2618 cent.....0.	10 cent.....1.	
	66.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana esculenta.
11 19	1st irritations ..	1847 cent 0. 5	10 cent..... 1.	
20	2d irritations....	1847 cent.....0. 5	50 cent .....2.	
21	3d irritations ..	1847 cent.....0. 5	50 cent.....0.	
22	4th irritations...	1847 cent.....0. 5	10 cent.....0.	
23	5th irritations...	2016 cent.....0.	55 cent.....2.	
27	6th irritations...	2562 cent.....0.	10 cent.....0. 5	
2 28	7th irritations...	2618 cent.....0.	10 cent..... 0. 5	
35	8th irritations ..	2728 cent.....0.	10 cent.....0. 5	
36	9th irritations ..	2618 cent.....0.	10 cent.....0. 5	
37	10th irritations..	2618 cent.....0.	55 cent.....0. 5	
	67.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
3 17	1st irritations ..	1413 cent.....0.	50 cent.....4.	Distance between electrodes 3 mm.
20	2d irritations....	1634 cent .....0.	50 cent.....2.	
22	3d irritations....	1634 cent.....0.	50 cent.....2.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	68.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
h. m.				
10 35	1st irritations...	1951 cent 1.5	57 cent.....1.5	
42	2d irritations....	2295 cent.....0.	57 cent ..... 2.	
43	3d irritations....	2295 cent.....1.	57 cent ..... 1.	
11 15	4th irritations...	1526 cent.....0.5	57 cent.....0.5	
16	5th irritations...	1526 cent 0.2	57 cent .....1.	
17	6th irritations...	1526 cent.....0.5	57 cent.....0.5	
18	7th irritations...	1526 cent.....0.5	10 cent.....0.5	
19	8th irritations...	1526 cent.....1.	10 cent.....0.5	
20	9th irritations...	1523 cent.....0.5	10 cent 0.5	
30	10th irritations..	1526 cent 0.5	10 cent.....0.5	
37	11th irritations .	1526 cent 0.5	10 cent..... 0.5	
45	12th irritations..	1526 cent.....0.5	57 cent.....0.5	
46	13th irritations..	1526 cent 0.5	57 cent.....0.5	
48	14th irritations..	1526 cent.....0.5	10 cent..... 0.5	
	69.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rhoechord:	Rana temporaria. Distance between electrodes 8 mm.
2 35	1st irritations...	2675 cent .....0.	10 cent.....0.	
3 00	2d irritations....	2618 cent.....0.5	58 cent.....1.	
03	3d irritations ...	2618 cent.....0.	58 cent.....2.	

Out of the ten experiments made in this manner, in six (60, 64, 65, 66, 67, and 69) the polarizing current produced an increased excitability, and failed to produce this effect in four experiments.

In the following experiments, made after the same plan, the muscular contractions following the opening of the irritating current are recorded.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	70.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
h. m.				
2 15	1st irritations ..	2728 cent 1.5	10 cent.. .... 2.	
22	2d irritations....	2728 cent.....2.	57 cent.....2.	
24	3d irritations	2728 cent.....0.	57 cent.....0.5	
25	4th irritations ..	2728 cent.....0.	10 cent.....0.5	
35	5th irritations...	2675 cent 0.5	10 cent.....0.5	
36	6th irritations...	2675 cent.....0.5	10 cent.....1.	
37	7th irritations ..	2675 cent 0.5	58 cent.....0.5	
45	8th irritations...	2618 cent.....0.5	58 cent.....1.	
47	9th irritations ..	2618 cent.....0.	58 cent.....0.5	
3 00	10th irritations..	2618 cent.....0.5	58 cent.....1.	
03	11th irritations..	2618 cent.....0.5	58 cent.....1.	
08	12th irritations..	2618 cent.....0.	58 cent.. .....2.	
	71.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
11 15	1st irritations...	1526 cent.....2.5	57 cent.....3.	
16	2d irritations....	1526 cent .....3.	57 cent.....3.	
17	3d irritations....	1526 cent.....0.5	57 cent.....0.5	
18	4th irritations ..	1526 cent .....3.	10 cent.....3.	
19	5th irritations ..	1526 cent .....3.	10 cent.....3.	
20	6th irritations...	1526 cent.....0.5	10 cent.....2.	
30	7th irritations...	1526 cent.....1.	10 cent.....1.5	
45	8th irritations ..	1526 cent.....0.5	57 cent.....0.5	
46	9th irritations ..	1526 cent.....0.5	57 cent.....0.5	
48	10th irritations..	1526 cent 0.5	57 cent.....0.5	
	72.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana esculenta.
10 21	1st irritations ..	2675 cent.....1.5	15 cent.....3.	
45	2d irritations ..	2618 cent.....0.5	10 cent.....1.5	
46	3d irritations....	2618 cent.....0.5	50 cent.....1.5	
49	4th irritations.	1847 cent.....1.	10 cent.....1.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
10 50	5th irritations ..	1847 cent.....1.	50 cent.....2.	
53	6th irritations ..	2016 cent.....1.	55 cent.....2.	
57	7th irritations...	2562 cent.....0. 5	55 cent.....1.	
58	8th irritations...	2618 cent.....0. 5	55 cent.....1.	
11 05	9th irritations...	2728 cent 0. 5	10 cent.....1.	
06	10th irritations..	2618 cent.....0. 5	10 cent.....1.	
07	11th irritations..	2618 cent.....0. 5	55 cent.....1. 5	
	73.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
11 15	1st irritations...	1526 cent.....0. 5	49 cent.....1.	
12 00	2d irritations....	888 cent.....2.	10 cent.....3.	
00½	3d irritations....	888 cent.....2.	49 cent.....3.	
01	4th irritations...	888 cent.....2.	49 cent.....3.	
01½	5th irritations ..	888 cent.....2.	10 cent..... 3.	
07	6th irritations...	888 cent 0. 5	49 cent.....0. 2	
08	7th irritations...	888 cent.....1.	10 cent.....0. 2	
	74.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
4 15	1st irritations ..	1957 cent..... 0. 5	50 cent.....1. 5	
17	2d irritations....	1957 cent.....0. 5	10 cent.....0. 5	
20	3d irritations....	341 cent.....5.	10 cent.....5.	
21	4th irritations ..	1214 cent.....5.	50 cent.....5.	
22	5th irritations...	1214 cent.....5.	10 cent.....5.	
23	6th irritations...	1214 cent.....5.	10 cent.....5.	
50	7th irritations ..	2016 cent.....2.	49 cent.....3.	
	75.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
3 06	1st irritations...	3003 cent 0. 2	10 cent.....3.	
08	2d irritations....	3003 cent.....0.	55 cent.....3.	
10	3d irritations....	3003 cent.....0. 5	55 cent.....2.	
15	4th irritations...	2781 cent.....2.	55 cent.....3.	
16	5th irritations ..	2781 cent.....0.	10 cent.....3.	
16½	6th irritations...	2781 cent.....0.	55 cent.....3.	
20	7th irritations ..	2781 cent.....1.	55 cent.....2.	

In four of these experiments the polarizing current usually produced an increased excitability of the nerve to the side of the negative pole; while in two experiments the polarization seemed to have little or no influence on the effect of the irritating current.

A "half-saturated" solution of pure chloride of sodium was now substituted for the irritating current and the experiment repeated in this manner. The solution was applied to the nerve near the muscle and 5^{mm} below the point of application of the descending polarizing current.

EXPERIMENT 76.—Sciatic nerve and gastrocnemius muscle of a Rana esculenta.

Polarizing current from 1 *Daniel.*

First irritations.—Salt solution alone=1. With polarization, 3.
Second irritations.—Salt solution alone=1. With polarization, 0
Third irritations.—Salt solution alone=1. With polarization, 0.
Fourth irritations.—Salt solution alone=1. With polarization, 0.
Fifth irritations.—Salt solution alone=1. With polarization, 0.
Sixth irritations.—Salt solution alone=1. With polarization, 0.
Seventh irritations.—Salt solution alone=1. With polarization, 0.

EXPERIMENT 77.

Polarization current from 2 Daniels.

Eighth irritations.—Salt solution alone=1. With polarization, 0.
Ninth irritations.—Salt solution alone=1. With polarization, 0.
Tenth irritations.—Salt solution alone=1. With polarization, 0.
Eleventh irritations.—Salt solution alone=1. With polarization, 0.

EXPERIMENT 78.—Sciatic nerve and gastrocnemius muscle of a Rana esculenta.

Polarizing current from 1 Daniel cell.

First irritations.—Salt solution=3. With polarization, 5.
Second irritations.—Salt solution=3. With polarization, 5.
Third irritations.—Salt solution=3. With polarization, 5.
Fourth irritations.—Salt solution=2. With polarization, 5.
Fifth irritations.—Salt solution=2. With polarization, 5.

EXPERIMENT 79.—Sciatic nerve and gastrocnemius muscle of a Rana esculenta.

Polarization current from 4 Daniel cells.

First irritations.—Salt solution alone=0.5. With polarization, 0.
Second irritations.—Salt solution alone=1. With polarization, 3.
Third irritations.—Salt solution alone=1. With polarization, 2.
Fourth irritations.—Salt solution alone=1. With polarization, 2.

EXPERIMENT 80.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

Polarizing current from 4 Daniel cells.

First irritations.—Salt solution alone=1. With polarization, 5.
Second irritations.—Salt solution alone=1. With polarization, 5.
Third irritations.—Salt solution alone=1. With polarization, 5.
Fourth irritations.—Salt solution alone=1. With polarization, 5.

EXPERIMENT 81.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

Polarizing current from 1 Daniel cell.

First irritations.—Salt solution alone=1.5. With polarization, 3.
Second irritations.—Salt solution alone=1.5. With polarization, 1.5.
Third irritations.—Salt solution alone=1.5. With polarization, 1.5.

After twenty minutes:

Fourth irritations.—Salt solution alone=1. With polarization, 3.
Fifth irritations.—Salt solution alone=1. With polarization, 3.
Sixth irritations.—Salt solution alone=1. With polarization, 3.
Seventh irritations.—Salt solution alone=0.5. With polarization, 4.
Eighth irritations.—Salt solution alone=0.5. With polarization, 4.
Ninth irritations.—Salt solution alone=0.5. With polarization, 4.
Tenth irritations.—Salt solution alone=0.5. With polarization, 4.

EXPERIMENT 82.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

Polarizing current from 4 Daniel cells.

First irritations.—Salt solution alone=1.5. With polarization, 2.
Second irritations.—Salt solution alone=1.5. With polarization, 3.
Third irritations.—Salt solution alone=1.5. With polarization, 0.
Fourth irritations.—Salt solution alone=1.5. With polarization, 0.

Fifth irritations.—Salt solution alone=1.5. With polarization, 0.5.
Sixth irritations.—Salt solution alone=1.5. With polarization, 0.5.

EXPERIMENT 83.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

Polarizing current from 4 Daniel cells.

First irritations.—Salt solution alone=2. With polarization, 2.
Second irritations.—Salt solution alone=2. With polarization, 2.
Third irritations.—Salt solution alone=2. With polarization, 2.
Duration of experiment 13 minutes.

EXPERIMENT 84.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

Polarizing current from 4 Daniel cells.

First irritations.—Salt solution alone=0.5. With polarization, 0.5.
Second irritations.—Salt solution alone=0.5. With polarization, 0.8.
Third irritations.—Salt solution alone=0.5. With polarization, 1.
Fourth irritations.—Salt solution alone=0.5. With polarization, 0.5.
Fifth irritations.—Salt solution alone=0.5. With polarization, 1.
Sixth irritations.—Salt solution alone=0.5. With polarization, 0.

EXPERIMENT 85.—Sciatic nerve and gastrocnemius muscle of a Rana temporaria.

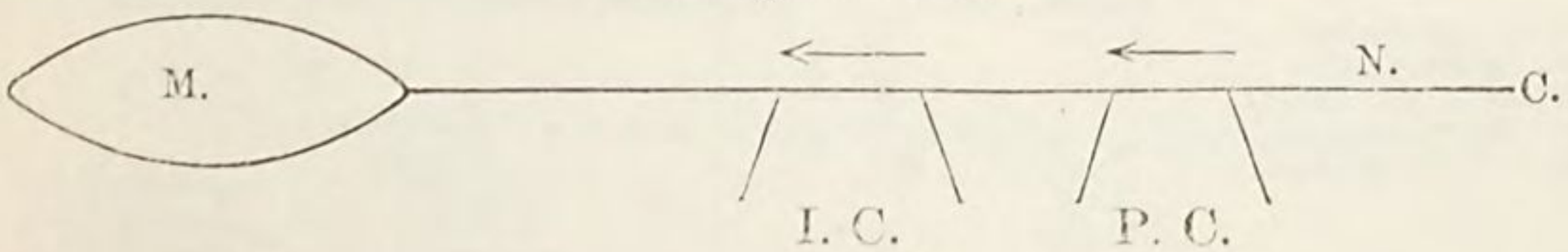
Polarizing current from 4 Daniel cells.

First irritations.—Salt solution alone=3. With polarization, 4.
Second irritations.—Salt solution alone=3. With polarization, 4.
Third irritations.—Salt solution alone=3. With polarization, 4.
Fourth irritations.—Salt solution alone=3. With polarization, 3.5.
Fifth irritations.—Salt solution alone=3. With polarization, 3.5.
Sixth irritations.—Salt solution alone=3. With polarization, 3.5.
Seventh irritations.—Salt solution alone=3. With polarization, 3.
Eighth irritations.—Salt solution alone=0. With polarization, 2.
Ninth irritations.—Salt solution alone=0. With polarization, 2.5.
Tenth irritations.—Salt solution alone=0. With polarization, 2.
Eleventh irritations.—Salt solution alone=0. With polarization, 2.

This series of experiments made with chemical irritants certainly give us no more reason to believe in the infallibility of Pflügers "laws" than the preceding series.

In finishing these series of experiments the following conclusion seems to be demanded by the facts observed: *When a descending polarizing current is applied to a nerve above a descending irritating current, the effect of the latter in exciting the nerve to produce muscular contractions is not necessarily increased during the passage of the former.* On the contrary, it often appears to be less irritating during the passage of the descending polarizing current through the nerve.

The ascending polarizing current applied to a nerve above a descending irritating current.



The irritation being here to the side of the anode, it should, according to Pflüger, produce a stronger contraction during the absence than during the presence of the constant or polarizing current. The method of experimenting adopted was that described some pages back. As there, the first experiments were made with the closing of an electric circuit as an irritant.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	86.			
h. m.		Irritation, 2 cells:	Polarization:	Rana temporaria.
	1st irritations...	3.	4 cells.....1.	
	2d irritations....	3.	2 cells .....0.	
	3d irritations....	1. 5	0.	
	4th irritations...	0. 5	0.	
	5th irritations...	1.	0.	
	87.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
	1st irritations...	3703 cent 0. 5	0.	
	2d irritations....	3703 cent.....0. 5	1.	
	3d irritations....	2907 cent.....0. 5	1.	
	4th irritations...	2675 cent.....0.	0. 5	
	5th irritations...	2781 cent.....2.	0.	
	6th irritations...	2781 cent.....1. 5	2.	10 minutes later.
	7th irritations...	1214 cent .....0.	3.	
	8th irritations...	1308 cent.....0.	3.	
	9th irritations...	1308 cent.....0.	3.	
	10th irritations..	1308 cent.....0.	3.	
	11th irritations..	223 cent.....0. 5	3.	
	12th irritations..	223 cent.....0. 5	3.	
	13th irritations..	223 cent.....0. 5	3.	
	88.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
	1st irritations...	3109 cent.....0.	0. 5	
	2d irritations....	3109 cent.....0.	0. 5	
	3d irritations....	3109 cent.....0.	0. 5	
	4th irritations...	3109 cent.....0.	0. 5	
	89.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
2 46	1st irritations	3109 cent.....0. 5	0. 5	
3 05	2d irritations....	3109 cent 0. 5	0. 5	
10	3d irritations....	3109 cent.....0. 5	0. 5	
13	4th irritations ..	3109 cent 0. 5	0. 5	
20	5th irritations ...	3109 cent 0. 5	0. 5	
25	6th irritations...	3109 tent.....0. 5	0. 5	
30	7th irritations...	3109 cent.....0. 5	0. 5	
35	8th irritations...	3109 cent.....0. 5	0. 5	
	90.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
	1st irritations ..	1.	3.	
	2d irritations ...	1.	0. 5	
	3d irritations ...	1.	0. 5	
	91.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria
9 09	1st irritations ..	1.	0.	
13	2d irritations....	1.	0.	
	92.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
10 05	1st irritations...	1.	0.	
07	2d irritations....	1.	3.	
11	3d irritations....	1.	3.	
40	4th irritations...	1.	3.	
11 00	5th irritations...	1.	0. 5	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	93.			
h. m.		Irritation, 1 cell:	Polarization, 2 cells:	Rana esculenta.
12 04	1st irritations...	1,	0. 5	
10	2d irritations....	1.	0. 5	
15	3d irritations....	1.	0. 5	
	94.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
3 08	1st irritations...	1.	0.	
14	2d irritations....	1.	0.	
19	3d irritations....	1.	0.	
4 10	4th irritations...	1.	0. 5	
	95.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana esculenta.
9 59½	1st irritations...	1.	0. 5	
10 02	2d irritations....	1.	0.	
03	3d irritations....	1.	0.	
05	4th irritations...	0.	0.	
07	5th irritations...	0.	0.	
	96.			
		Irritation, 1 cell:	Polarization:	Rana esculenta.
10 35	1st irritations...	1.	4 cells.....0.	
37	2d irritations....	1.	2 cells.....0.	
38	3d irritations ...	1.	0,	
40	4th irritations...	1.	0.	
43	5th irritations...	1.	0.	
44	6th irritations...	1.	0.	
45	7th irritations...	1.	0.	
53	8th irritations...	1.	0. 5	
11 06	9th irritations...	1.	1.	
	97.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
11 10	1st irritations...	1.	3.	
12	2d irritations....	1.	3.	
13	3d irritations....	1.	1.	
22	4th irritations...	1.	0. 5	
	98.			
		Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
11 40	1st irritations...	1.	0. 5	
47	2d irritations....	1.	0. 5	
49	3d irritations....	1.	0. 5	
	99.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta. Weak irritating currents.
2 09	1st irritations...	1.	0.	
10	2d irritations....	1.	0.	
13	3d irritations....	1.	0.	
	100.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Last frog again used. Strong irritating currents.
2 15	1st irritations...	1.	4.	
20	2d irritations....	1.	4.	
23½	3d irritations....	1.	3.	
25	4th irritations...	1.	3.	
	101.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
3 42	1st irritations...	2458 cent.....1.	0. 5	
45	2d irritations....	2350 cent.....1.	0. 5	
48	3d irritations....	2350 cent.....1.	0 5	
4 00	4th irritations...	2127 cent.....0.	3.	
	102.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana esculenta.
4 17	1st irritations...	2907 cent.....0. 5	0.	
19	2d irritations....	2907 cent.....0. 5	0.	
21	3d irritations....	1793 cent.....1.	3.	
24	4th irritations...	2781 cent.....1. 5	0.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	103.			
h. m.		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana esculenta.
4 02	1st irritations...	2562 cent.....0.	0.	
06	2d irritations....	2562 cent.....0.	0.	
10	3d irritations....	2249 cent.....1.	0.	
13	4th irritations ..	2249 cent.....1.	0. 5	
16	5th irritations...	2249 cent.....1.	1.	
20	6th irritations ...	2249 cent.....1.	1.	
30	7th irritations...	2249 cent.....1.	0. 5	
35	8th irritations...	2249 cent.....1.	0.5	
	104.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	, Rana esculenta.
5 05	1st irritations...	2781 cent.....0.	3.	
13	2d irritations....	2675 cent.....0.	3.	
20	3d irritations....	2458 cent.....3.	2.	
23	4th irritations ...	223 cent.....1. 5	1.	
29	5th irritations ..	223 cent.....1. 5	3.	
33	6th irritations ..	1634 cent.....1.	0. 5	
35	7th irritations...	2127 cent.....1.	0.	
36	8th irritations...	1634 cent.....1.	0.	
37	9th irritations ..	1413 cent.....1.	0. 5	
37½	10th irritations..	1109 cent.....1.	0. 5	
39	11th irritations..	223 cent .....1.	0. 5	
43	12th irritations..	223 cent.....0.	3.	
44	13th irritations..	223 cent.....1.	0.	
56	14th irritations..	223 cent.....1.	0. 5	
	105.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana esculenta.
10 06	1st irritations...	1893 cent.....1.	0.	
14	2d irritations....	223 cent.....1.	2. 5	
17	3d irritations ...	2016 cent.....1.	0. 5	
18	4th irritations...	223 cent.....1.	3.	
19	5th irritations...	1893 cent .....0.	0. 5	
20	6th irritations...	1793 cent.....0.	0.	
21	7th irritations...	1634 cent .....0.	0.	
21½	8th irritations...	1526 cent.....0.	0.	
	106.			
		Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
10 35	1st irritations...	2955 cent.....1.	4 cells.....0.	
37	2d irritations....	2955 cent.....1.	1 cell.....0.	
40	3d irritations....	2955 cent.....0. 5	4 cells.....0.	
50	4th irritations ..	2955 cent .....0.	0.	
53	5th irritations...	2401 cent.....2.	2.	
55	6th irritations ..	2728 cent.....2.	1.	
59	7th irritations...	2728 cent.....1.	0.	
11 00	8th irritations...	2728 cent.....0.	0.	
12	9th irritations...	2728 cent.....0.	0.	
16	10th irritations..	223 cent.....1. 5	1. 5	
20	11th irritations..	2728 cent.....1.	1. 5	
25	12th irritations..	2728 cent.....1.	0. 5	
28	13th irritations..	2728 cent.....1.	0. 5	
34	14th irritations..	2728 cent.....1.	0. 5	
40	15th irritations..	2728 cent.....1.	0. 5	
43	16th irritations..	2728 cent.....1.	0. 5	
54	17th irritations..	2728 cent.....1.	0. 5	
12 00	18th irritations..	2728 cent.....1.	0. 5	
	107.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
12 12	1st irritations...	223 cent.....3.	3.	
19	2d irritations....	223 cent.....3.	3.	
40	3d irritations....	223 cent.....3.	3.	
	108.			
		Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
1 05	1st irritations...	3179 cent .....0.	3.	
09	2d irritations....	3198 cent .....0.	3.	
11	3d irritations....	223 cent .....3.	3.	
12	4th irritations...	3198 cent .....0.	3.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
1 37	5th irritations...	2849 cent.....1.	0.	
39	6th irritations...	2[illegible]5 cent.....1.	1.	
40	7th irritations...	223 cent 2. 5	2. 5	
56	8th irritations...	3194 cent.....0.	2. 5	
2 05	9th irritations...	223 cent.....1. 5	0. 5	
25	10th irritations..	223 cent.....1.	1.	
	109.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta.
3 20	1st irritations...	3109 cent.....0.	0.	
23	2d irritations....	1847 cent.....2.	0. 5	
24	3d irritations....	1413 cent 2. 5	1.	
27	4th irritations...	223 cent.....4.	4.	
	110.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
3 40	1st irritations...	3197 cent.....0.	3.	
42	2d irritations....	3197 cent.....0.	4.	
43	3d irritations....	3197 cent.....0.	3.	
48	4th irritations...	3197 cent.....0.	2.	
50	5th irritations...	223 cent.....0.	3.	
51	6th irritations...	3109 cent.....0.	3.	
57	7th irritations...	1 cell .....5.	5.	
4 05	8th irritations...	1 cell.....0.	3.	
16	9th irritations...	1 cell.....3.	5.	
	111.			
		Irritation, 1 cell:	Polarization, 2 cells:	Rana temporaria.
4 28	1st irritations...	2.	2.	
38	2d irritations....	4.	4.	
45	3d irritations....	4.	2.	
		Rheochord:		
50	4th irritations...	1580 cent.....4.	0.	
55	5th irritations...	2726 cent.....0.	2.	
5 00	6th irritations...	2728 cent.....1.	1.	
05	7th irritations...	2728 cent.....1.	0.	
10	8th irritations...	2728 cent.....2.	0.	
15	9th irritations...	2728 cent.....1.	0.	
20	10th irritations..	2728 cent.....1.	0. 5	
26	11th irritations..	2728 cent.....1.	2.	
31	12th irritations..	2728 cent.....5.	0. 5	
36	13th irritations..	2728 cent.....4.	0. 5	
37	14th irritations..	2781 cent.....0.	2.	
	112.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
5 41	1st irritations...	2728 cent.....3.	0.	
46	2d irritations....	2728 cent .....4.		
51	3d irritations....	2781 cent.....4.	0.	
56	4th irritations...	2781 cent.....3.	0.	
6 01	5th irritations...	2781 cent.....3.	0.	
06	6th irritations...	2781 cent.....3.	0.	
13	7th irritations...	2849 cent.....5.	0.	
18	8th irritations...	2849 cent.....1.	0.	
20	9th irritations...	2849 cent.....1.	0.	
26	10th irritations..	2849 cent.....3.	0.	
	113.			
		Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
2 35	1st irritations...	3187 cent.....0.	1. 5	
3 03	2d irritations....	223 cent.....5.	3.	
09	3d irritations....	1793 cent.....4.	4.	
14	4th irritations...	1793 cent.....3.	2.	
16	5th irritations...	2510 cent.....3.	1. 5	
21	6th irritations...	2510 cent.....4.	0.	
26	7th irritations...	2510 cent.....2.	0.	
42	8th irritations...	2510 cent.....2. 5	0.	
	114.			
		Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
8 54	1st irritations...	3109 cent.....0.	2.	
9 06	2d irritations....	2183 cent.....3.	0.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
9 10	3d irritations....	2183 cent.....0.	0.	
14	4th irritations...	2016 cent.....2.	0.	
25	5th irritations...	1360 cent.....3.	0.	
30	6th irritations...	1360 cent.....1.	0.	
36	7th irritations...	1360 cent.....0. 5	0.	
40	8th irritations...	1360 cent.....0. 5	0.	
	115.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
10 14	1st irritations...	3197 cent.....0.	5.	
17	2d irritations....	3197 cent.....0.	5.	
21	3d irritations....	3197 cent.....0.	5.	
25	4th irritations...	3058 cent.....0.	5.	
26	5th irritations...	3003 cent.....5.	5.	
29	6th irritations...	3003 cent.....5.	3.	
36	7th irritations...	3003 cent.....4.	1.	
41	8th irritations...	3003 cent.....3.	1.	
52	9th irritations...	2955 cent.....2.	0.	
54½	10th irritations..	2955 cent.....2.	0.	
57½	11th irritations..	2955 cent.....2.	0.	
11 04½	12th irritations..	2955 cent.....1.	0.	
	116.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
8 47	1st irritations...	3197 cent.....0.	5.	
52	2d irritations....	3197 cent.....0.	5.	
57	3d irritations....	3197 cent.....0.	5.	
9 01	4th irritations...	3058 cent.....1.	5.	
10	5th irritations...	3058 cent.....2.	5.	
15	6th irritations...	3058 cent .....0.	4.	
23	7th irritations...	3058 cent.....0. 5	2.	
28	8th irritations...	3058 cent.....0. 5	1.	
33	9th irritations...	3058 cent.....0. 5	1.	
36	10th irritations..	3058 cent.....0.	3.	
40	11th irritations..	2955 cent.....2.	4.	
	117.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
9 52	1st irritations...	2849 cent.....2.	1.	
54	2d irritations....	2728 cent.....4.	1.	
56	3d irritations....	2728 cent.....3.	0.	
58	4th irritations...	2350 cent.....4.	3.	
10 01	5th irritations...	2350 cent.....4.	1.	
03	6th irritations...	223 cent.....5.	5.	
05	7th irritations...	2350 cent.....4.	1.	
32	8th irritations...	2562 cent.....4.	2.	
33	9th irritations...	2562 cent.....4.	0.	
34	10th irritations..	2849 cent.....2.	0.	
35	11th irritations..	2955 cent.....0. 5	0.	
38	12th irritations..	2901 cent.....2.	0.	
39	13th irritations..	2901 cent.....3.	1.	
42	14th irritations..	3003 cent.....2.	2.	
44	15th irritations..	3003 cent.....3.	2.	
	118.	Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
		3000 cent.....0. 5	1 cell.....4.	
11 00	1st irritations...	3000 cent.....0. 5	4 cells.....3.	
01	2d irritations....	3000 cent.....0. 5	1 cell.....0.	
02	3d irritations....	3000 cent.....0. 5	4 cells.....4.	
03	4th irritations...	3000 cent.....2.	4 cells.....4.	
06	5th irritations...	3000 cent.....2.	1 cell.....0.	
07	6th irritations...			
	119.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
11 12	1st irritations...	2781 cent.....0.	5.	
15	2d irritations....	2675 cent.....0. 5	5.	
30	3d irritations....	2675 cent.....0.	5.	
31	4th irritations...	2562 cent.....2.	5.	
32	5th irritations...	2562 cent.....1.	5.	
40	6th irritations...	3058 cent.....0.	5.	
41	7th irritations...	3003 cent.....1.	5.	
46	8th irritations...	3003 cent.....2.	4.	
48	9th irritations...	3003 cent.....2.	4.	
53	10th irritations..	3003 cent.....0.	4.	
55	11th irritations..	3003 cent.....0.	5.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	120.	Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
h. m.				
1 07	1st irritations...	3197 cent..... 1.	4 cells.....3.	
09	2d irritations....	3197 cent.....0. 5	1 cell.....0.	
10	3d irritations....	3179 cent.....0.	1 cell.....0.	
15	4th irritations...	3179 cent.....0.	4 cells.....4.	
20	5th irritations...	3003 cent..... 1.	1 cell.....2.	
22	6th irritations...	3003 cent.....2.	3.	
28	7th irritations...	3003 cent.....0. 5	3.	
30	8th irritations...	3003 cent.....0. 5	3.	
34	9th irritations...	3003 cent.....0. 5	3.	
35	10th irritations..	3003 cent.....0.	4.	
41	11th irritations..	3003 cent.....3.	4.	
	121.	Irritation, 1 cell, rheochord:	Polarization:	Rana temporaria.
2 03	1st irritations...	3003 cent.....2.	1 cell.....0.	
05	2d irritations....	1160 cent.....4.	1 cell.....4.	
06	3d irritations....	1160 cent.....4.	4 cells.....4.	
07	4th irritations...	341 cent.....4.	4 cells.....4.	
07½	5th irritations...	341 cent.....4.	1 cell.....4.	
08	6th irritations...	3003 cent.....1.	1 cell.....0.	
09	7th irritations...	3003 cent.....1. 5	4 cells.....3.	
12	8th irritations...	3003 cent.....0. 5	4 cells.....2.	
13	9th irritations...	3003 cent.....0. 5	1 cell.....0.	
14	10th irritations..	3003 cent.....4.	1 cell.....4.	
15	11th irritations..	3003 cent.....4.	4 cells..... 4.	
18	12th irritations..	2950 cent.....0. 5	1 cell.....0.	
20	13th irritations..	700 cent.....4. 5	4 cells.....5.	
21	14th irritations..	700 cent.....4. 5	1 cell.....5.	
22	15th irritations..	2775 cent.....1.	1 cell.....0.	
26	16th irritations..	2675 cent.....3.	4 cells.....0.	
28	17th irritations..	2675 cent.....2.	1 cell.....0.	
	122.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
11 29	1st irritations...	3197 cent.....2.	3 cent.....5.	
31	2d irritations....	3197 cent.....2.	3 cent.....5.	Polarization, 1 cell.
33	3d irritations....	3176 cent.....0.	0 cent.....3.	
45	4th irritations...	3176 cent.....0.	5 cent.....3.	
50	5th irritations...	3176 cent.....0.	2 cent.....3.	
54	6th irritations...	2910 cent.....0. 5	20 cent.....1.	
57	7th irritations...	2910 cent.....0.	20 cent.....2.	
	123.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
9 04	1st irritations...	3018 cent.....0.	1 cent.....2.	
05	2d irritations....	3018 cent.....0.	20 cent.....3.	
06	3d irritations....	3018 cent..... 2.	20 cent.....4.	
07	4th irritations...	2875 cent.....0.	10 cent.....1.	
10	5th irritations...	2850 cent.....0.	20 cent.....0. 5	
	124.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
9 27	1st irritations...	1400 cent.....3.	20 cent... ....3.	
40	2d irritations....	2125 cent.....0.	20 cent.....0.	
43	3d irritations....	2125 cent.....0.	20 cent.....0.	
	126.	Irritation, 1 cell, rheochord:	Polarization, 4 celis, rheochord:	Rana temporaria.
9 50	1st irritations...	223 cent.....1.	10 cent.....1. 5	
56	2d irritations....	223 cent.....0. 5	10 cent.....1.	
10 01	3d irritations....	223 cent.....1.	10 cent.....1. 5	
	127.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
11 00	1st irritations...	3100 cent.....1.	48 cent.....1.	
10	2d irritations....	3025 cent.....2.	30 cent.....3.	
11	3d irritations....	3025 cent.....1.	30 cent.....2.	
18	4th irritations...	3025 cent.....0. 5	30 cent.....2.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
11 22	5th irritations...	2950 cent.....2.	30 cent.....4.	
25	6th irritations...	2950 cent.....2.	30 cent.....2.	
28	7th irritations...	2950 cent.....3.	30 cent.....4.	
29	8th irritations...	2950 cent.....3.	30 cent.....3.	
32	9th irritations...	2950 cent.....2.	30 cent.....3.	
34	10th irritations..	2950 cent.....2.	30 cent.....2.	
40	11th irritations..	2790 cent.....4.	30 cent.....5.	
42	12th irritations..	2790 cent.....5.	30 cent.....5.	
45	13th irritations..	2875 cent.....3.	30 cent.....3.	
46	14th irritations..	2875 cent.....3.	30 cent.....3.	
48	15th irritations..	2875 cent.....1.	30 cent.....3.	
50	16th irritations..	2875 cent.....0.	30 cent.....3.	
52	17th irritations..	2730 cent.....2.5	30 cent.....5.	
53	18th irritations..	2730 cent.....4.	30 cent.....5.	
54	19th irritations..	2730 cent.....3.	30 cent.....5.	
55	20th irritations..	2730 cent.....3.	30 cent.....5.	
57	21st irritations..	2730 cent.....3.	30 cent.....4.5	
58	22d irritations...	2730 cent.....3.	50 cent.....5.	
12 02	23d irritations...	2730 cent.....1.	50 cent.....5.	
15	24th irritations..	2600 cent.....5.	50 cent.....1.5	
16	25th irritations..	2700 cent.....3.	50 cent.....5.	
20	26th irritations..	2700 cent.....3.	50 cent.....3.	
25	27th irritations..	2700 cent.....2.5	50 cent.....3.5	
27	28th irritations..	2700 cent.....2.5	50 cent.....3.	
30	29th irritations..	2700 cent.....2.5	50 cent.....3.	
32	30th irritations..	2700 cent.....2.5	50 cent.....4.	
36	31st irritations..	2700 cent.....2.5	50 cent.....3.	
38	32d irritations...	2700 cent.....4.	50 cent.....5.	
41	33d irritations...	2700 cent.....2.5	50 cent.....3.	
44	34th irritations..	2700 cent.....2.	50 cent.....2.5	
54	35th irritations..	2700 cent.....3.	50 cent.....4.5	
	128.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
2 58	1st irritations ...	2295 cent.....3.	30 cent.....3.	
59	2d irritations....	2401 cent.....2.	30 cent.....2.	
3 00	3d irritations....	2401 cent.....3.	30 cent.....3.	
01	4th irritations...	2401 cent.....3.	10 cent.....5.	
04	5th irritations...	2675 cent.....2.	10 cent.....2.5	
05	6th irritations...	2675 cent.....3.	10 cent.....5.	
06	7th irritations...	2781 cent.....1.	10 cent.....1.5	
12	8th irritations...	2781 cent.....0.5	10 cent.....0.5	
20	9th irritations...	2458 cent.....2.	10 cent.....3.	
28	10th irritations..	2901 cent.....0.	30 cent.....1.	
	129.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
3 41	1st irritations ...	2675 cent.....2.	30 cent.....3.	
44	2d irritations....	2675 cent.....1.	10 cent.....1.	
45	3d irritations....	2675 cent.....0.	10 cent.....2.	
55	4th irritations...	223 cent.....2.	10 cent.....2.	
56	5th irritations...	223 cent.....2.5	40 cent.....3.	
58	6th irritations...	223 cent.....3.	40 cent.....3.	
	130.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
1 20	1st irritations ...	2781 cent.....3.	49 cent.....4.	
21	2d irritations....	2901 cent.....3.	49 cent.....4.	
23	3d irritations....	2901 cent.....2.5	10 cent.....4.	
24	4th irritations...	2901 cent.....2.	10 cent.....4.	
30	5th irritations...	2901 cent.....3.	10 cent.....3.	
34	6th irritations...	2901 cent.....2.	10 cent.....3.	
	131.	Irritation, 1 cell, rheochord:	Polarization, 4 cells, rheochord:	Rana temporaria.
9 14	1st irritations ...	2955 cent.....4.	38 cent.....4.	
16	2d irritations....	3025 cent.....3.	20 cent.....3.	
19	3d irritations....	3150 cent.....0.	20 cent.....0.	
24½	4th irritations...	3197 cent.....2.	10 cent.....3.	
26½	5th irritations...	3197 cent.....2.	45 cent.....3.	
37	6th irritations...	3198 cent.....1.5	10 cent.....2.	
39	7th irritations...	3198 cent.....1.	10 cent.....2.	
40	8th irritations...	3198 cent.....0.5	30 cent.....1.5	
44	9th irritations...	3198 cent.....0.5	30 cent.....0.5	
46	10th irritations..	3189 cent.....0.5	30 cent.....1.	

Out of the preceding forty-five experiments twenty usually gave a decreased excitability of the nerve to the side of the anode of the constant current. In three experiments (89, 107, and 124) no effect was produced by the polarization. In one experiment (115) in the beginning an increased excitability was produced to the copper side of the constant current, and in another the result was inconstant. In twenty experiments, however, the irritating current usually or always produced an increased excitability of the nerve in the anelectrotonus portion of the nerve; *i. e.*, an effect directly opposite to that demanded by Pflüger's theory.

In the following experiments the opening instead of the closing of the irritating current is recorded:

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**132.**	Irritation, 2 cells:	Polarization, 4 cells:	Rana temporaria.
	1st irritations...	2.	0.5	
	2d irritations....	0.5	0.	
	3d irritations....	0.5	0.	
	4th irritations...	0.5	0.	
	5th irritations...	0.5	0.	
	133.	Irritation, 1 cell, rheochord:	Polarization, 2 cells:	Rana temporaria.
	1st irritations...	2500 cent.....1.5	0.	
	2d irritations....	2100 cent.....1.	0.	
	3d irritations....	2100 cent.....1.	1.	
	4th irritations...	2728 cent.....1.5	1.	
	5th irritations...	2728 cent.....1.	0.	
	6th irritations...	1308 cent.....1.5	1.	
	7th irritations...	1000 cent.....1.	0.	
	134.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
	1st irritations...	3100 cent.....1.	0.	
	2d irritations....	3100 cent.....1.	3.	
	3d irritations....	3100 cent.....0.	3.	
	4th irritations...	3100 cent.....0.	3.	
	135.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
	1st irritations...	3100 cent.....2.	1.	
	2d irritations....	3100 cent.....0.5	1.	
	3d irritations....	3100 cent.....2.	1.	
	4th irritations...	3100 cent.....1.	1.	
	5th irritations...	3100 cent.....1.	1.	
	6th irritations...	3000 cent.....1.	1.	
	7th irritations...	3000 cent.....1.	1.	
	8th irritations...	3000 cent.....1.	1.	
	136.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria,
	1st irritations...	0.	2.	
	2d irritations....	0.	1.5	
	3d irritations....	0.	1.5	
	137.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
	1st irritations...	0.	2.	
	2d irritations....	0.5	1.	
	3d irritations....	0.5	1.	
	4th irritations...	0.5	1.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**138.**	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
12 30	1st irritations...	0.5	0.	
45	2d irritations....	1.	0.	
46	3d irritations....	1.	0.	
48	4th irritations...	1.	0.	
54	5th irritations...	0.5	0.	
59	6th irritations...	1.	0.	
1 17	7th irritations...	1.	0.	
	139.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
3 09	1st irritations...	1.	0.	
10	2d irritations....	1.	0.	
12	3d irritations....	0 5	0.	
14	4th irritations...	0.5	0.	
16	5th irritations...	0.5	0.	
19	6th irritations...	0.5	0.	
	140.	Irritation, 1 cell:	Polarization, 4 cells:	Rana esculenta.
4 56	1st irritations...	1.	0.	
57	2d irritations....	1.	0.	
58	3d irritations....	1.	0.	
59	4th irritations...	1.	0.	
5 03	5th irritations...	1.	0.	
05	6th irritations ...	1.	0.	
06	7th irritations...	1.	0.	
09	8th irritations...	1.	0.	
14	9th irritations...	1.5	0.5	
18	10th irritations..	1.	1.	
	141.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
	1st irritations...	1.5	1.5	
	2d irritations....	2.	4.	
	3d irritations....	3.	3.	
	4th irritations...	1.5	1.5	
	142.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
1 00	1st irritations...	1.	0.5	
05	2d irritations....	1.	0.5	
10	3d irritations....	1.	0.	
	143.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
1 20	1st irritations...	1.	0.	
24	2d irritations....	1.	0.	
27	3d irritations....	1.	0.	
	144.	Irritation, 1 cell:	Polarization, 4 cells:	Rana temporaria.
1 32	1st irritations...	0.5	0.	
36	2d irritations....	0.5	0.	
39	3d irritations....	0.5	0.	
45	4th irritations...	1.	0.	
46	5th irritations...	1.	0.	
50	6th irritations...	1.	0.	
2 05	7th irritations...	1.	0.	
15	8th irritations ..			
	145.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana esculenta.
11 32	1st irritations...	2781 cent.....1.5	0.5	
40	2d irritations....	223 cent.....1.5	0.5	
43	3d irritations....	223 cent.....1.5	0.5	
	146.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
11 48	1st irritations...	2955 cent.....1.	5.	
50	2d irritations....	2955 cent.....1.	5.	
54	3d irritations....	2955 cent.....1.	4.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
12 00	4th irritations...	2955 cent.....0. 5	4.	
05	5th irritations...	2400 cent.....0. 5	3.	
07	6th irritations...	2720 cent.....3.	3.	
09	7th irritations ..	2720 cent.....3.	3.	
	147.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
12 22	1st irritations...	2700 cent.....1.	0. 5	
26	2d irritations....	223 cent.....4.	4.	
30	3d irritations....	2700 cent.....1.	1.	
32	4th irritations...	2700 cent.....1.	0. 5	
34	5th irritations...	2700 cent.....1.	0. 5	
38	6th irritations...	2700 cent.....1.	0.	
50	7th irritations...	2700 cent.....1.	0.	
52	8th irritations...	2700 cent.....1.	0.	
53	9th irritations...	2700 cent.....1.	0.	
1 00	10th irritations...	2700 cent.....1.	0.	
	148.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
2 20	1st irritations...	3170 cent.....0.	4.	
25	2d irritations....	3199 cent.....0.	4.	
29	3d irritations....	3199 cent.....0.	4.	
32	4th irritations...	223 cent.....4.	4.	
33	5th irritations...	3199 cent.....0.	4.	
35	6th irritations...	3199 cent.....0.	4.	
45	7th irritations...	3199 cent.....0.	4.	
47	8th irritations...	3199 cent.....0.	4.	
49	9th irritations...	3199 cent.....0.	4.	
50	10th irritations..	223 cent.....4.	4.	
3 00	11th irritations..	3199 cent.....0.	4.	
01	12th irritations..	3199 cent.....0.	3.	
10	13th irritations..	3199 cent.....0.	3.	
11	14th irritations..	223 cent.....3.	2.	
	149.	Irritation, 1 cell, rheochord:	Polarization, 4 cells:	Rana temporaria.
3 40	1st irritations...	3198 cent.....3.	0.	
42	2d irritations....	3198 cent.....2.	0.	
	150.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
4 00	1st irritations...	3198 cent.....0.	1.	
04	2d irritations....	3198 cent.....0.	3.	
10	3d irritations....	3198 cent.....0.	4.	
15	4th irritations...	3177 cent .....0.	1.	
20	5th irritations...	223 cent.....4.	4.	
35	6th irritations...	3177 cent.....0.	2.	
39	7th irritations ..	3169 cent.....0.	2.	
41	8th irritations ..	3169 cent.....0.	0. 5	
5 06	9th irritations ..	2510 cent.....0.	3.	
	151.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
9 15	1st irritations...	1070 cent.....3.	2.	
20	2d irritations....	1070 cent.....1.	0. 5	
25	3d irritations....	1360 cent.....0. 5	0. 5	
35	4th irritations...	1360 cent.....0. 5	0. 5	
	152.	Irritation, 1 cell, rheochord:	Polarization, 3 cells:	Rana temporaria.
9 54	1st irritations...	3000 cent.....3.	5.	
55	2d irritations....	3000 cent.....4.	5.	
10 01	3d irritations....	3000 cent.....3.	5.	
05	4th irritations...	3058 cent.....0.	5.	
12	5th irritations...	3058 cent.....0.	4.	
14	6th irritations...	2950 cent.....2.	4.	
18	7th irritations...	2950 cent.....2.	4.	
25	8th irritations...	2950 cent.....0.	4.	
27	9th irritations...	2950 cent.....0. 5	4.	
32	10th irritations..	2950 cent.....0.	4.	
37	11th irritations..	2950 cent.....0.	4.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**153.**	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
10 52	1st irritations...	3000 cent.....0.	1.	
56	2d irritations....	3000 cent.....0.	1.	
57	3d irritations....	3000 cent.....0.	2.	
	154.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
11 06	1st irritations ..	3000 cent.....0.	1.	
13	2d irritations....	3000 cent.....0.	1.	
18	3d irritations....	3000 cent.....0.	0. 5	
	155.	Irritation, 1 cell, rheochord:	Polarization, 1 cell:	Rana temporaria.
1 57	1st irritations...	3198 cent.....0.	1.	
59	2d irritations....	3179 cent.....0.	1.	
2 07	3d irritations....	3179 cent.....0.	2.	
10	4th irritations...	3000 cent.....0.	4.	
12	5th irritations...	3000 cent.....1.	0.	Polarization, 4 cells.
20	6th irritations...	3000 cent.....0.	4.	Polarization, 1 cell.
25	7th irritations...	1160 cent.....0.	1.	
26	8th irritations...	341 cent.....0.	1.	
27	9th irritations...	341 cent.....0.	1.	
28	10th irritations..	3000 cent.....0.	3.	
32	11th irritations..	3000 cent.....0.	3.	
34	12th irritations..	3000 cent.....0.	1.	
38	13th irritations..	2781 cent.....0.	0. 5	
42	14th irritations..	2690 cent.....1.	0.	
47	15th irritations..	2690 cent.....1.	0. 5	
	156.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana temporaria.
9 12	1st irritations ...	3196 cent.....0.	4 cent.....3.	
15	2d irritations....	3196 cent.....0.	4 cent.....3.	
18	3d irritations ...	3058 cent.....0. 5	4 cent.....5.	
22	4th irritations...	3058 cent.....0. 5	4 cent.....5.	
30	5th irritations...	3058 cent.....0. 5	4 cent.....5.	
	157.	Irritation, 1 cell, rheochord:	Polarization, 1 cell, rheochord:	Rana esculenta.
2 00	1st irritations ...	2900 cent.....0.	18 cent 0 5	
06	2d irritations....	2900 cent.....0. 5	18 cent.....2.	
11	3d irritations....	2900 cent.....0. 5	18 cent.....1.	
15	4th irritations...	2900 cent.....0. 5	18 cent.....1.	
	158.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
2 28	1st irritations ...	3050 cent.....0. 5	12 cent.....0. 5	
30	2d irritations....	3050 cent.....0. 5	12 cent.....0. 5	
32	3d irritations....	2900 cent.....1.	12 cent.....1.	
34	4th irritations...	2900 cent.....0. 5	30 cent.....3.	
35	5th irritations...	2900 cent.....0. 5	30 cent.....1.	
38	6th irritations...	2675 cent.....0.	30 cent.....1.	
41	7th irritations...	2675 cent.....0.	30 cent.....0. 5	
44	8th irritations...	2675 cent.....0.	10 cent.....3.	
	159.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
8 51	1st irritations ...	3130 cent.....0.	20 cent.....1.	
52	2d irritations....	3130 cent.....0.	20 cent.....0. 5	
55	3d irritations....	3196 cent.....0.	10 cent.....1.	
57	4th irritations...	3196 cent.....0.	45 cent.....1.	

Out of these last twenty-eight experiments, in but eleven was the irritation less effective in producing muscular contractions during the presence of the constant current than when the irritating current alone was

applied to the nerve; of the remaining experiments, in fourteen the opposite result was obtained, though the manner of experimenting was the same as adopted in the other experiments.

In the following experiments the nerves were irritated in their normal position, without having previously been injured. As in similar experiments, before described, made with the descending polarizing current, the non-polarizable electrodes had to be substituted by copper electrodes. These were covered with wax, except at the point where they touched the nerve. With this exception the apparatus was unchanged. In this series of experiments the irritation was made by the closing of a galvanic circuit.

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**160.**	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana esculenta.
	1st irritations ...	2675 cent.....0. 5	52 cent 0. 5	
	2d irritations ...	1847 cent.....1.	50 cent.....2.	
	3d irritations ...	1847 cent.....1.	10 cent.....1.	
	4th irritations...	2016 cent.....1.	52 cent.....1.	
	5th irritations...	2016 cent.....1.	52 cent.....1.	
	6th irritations...	2070 cent.....1.	10 cent.....0. 5	
	7th irritations...	2600 cent.....0. 5	10 cent.....0. 5	
	8th irritations...	2728 cent.....0. 5	10 cent.....0.	
	9th irritations...	2618 cent.....0. 5	10 cent 0. 5	
	10th irritations..	2618 cent.....0. 5	55 cent.....1. 5	
	161.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations ...	890 cent.....1.	48 cent.....0. 5	
	2d irritations ...	890 cent.....1.	11 cent.....1.	
	3d irritations ...	890 cent.....0. 5	11 cent.....2.	
	4th irritations...	890 cent.....0.	49 cent.....2.	
	5th irritations...	890 cent.....0.	11 cent .....2.	
	6th irritations...	890 cent .....0.	10 cent.....2.	
	7th irritations...	890 cent.....0. 5	10 cent.....0.	
	8th irritations...	890 cent.....1.	49 cent.....1. 5	
	162.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	1500 cent.....0. 5	10 cent.....1.	
	2d irritations ...	1800 cent.....0. 5	50 cent.....1.	
	3d irritations ...	1800 cent.....0.	50 cent.....0. 5	
	163.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	3000 cent.....0.	25 cent.....0. 5	
	2d irritations ...	3000 cent.....4.	25 cent.....5.	
	3d irritations ...	3000 cent.....2.	25 cent.....2.	
	4th irritations...	1739 cent.....2.	50 cent.....2.	
	5th irritations...	1739 cent.....2.	50 cent.....2.	
	6th irritations...	1739 cent.....2.	10 cent.....2.	
	7th irritations...	393 cent.....2.	40 cent.....4.	
	164.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	2500 cent.....2.	52 cent.....3.	
	2d irritations ...	2500 cent.....2.	52 cent.....4.	
	3d irritations ...	2500 cent.....2.	12 cent.....2.	
	4th irritations...	2100 cent.....0. 5	52 cent.....1.	
	165.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	1950 cent.....2.	57 cent.....2.	
	2d irritations ...	1950 cent.....1. 5	57 cent.....1. 5	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.				
	3d irritations ...	2675 cent.....0. 2	57 cent.....0. 3	
	4th irritations...	2400 cent.....2.	57 cent.....2.	
	5th irritations...	2400 cent.....1.	57 cent.....0. 5	
	6th irritations...	2300 cent.....1.	57 cent.....0. 5	
	7th irritations...	2300 cent.....0.	57 cent.....0. 5	
	8th irritations...	2300 cent.....1.	57 cent.....1.	
	166.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	**Rana temporaria.**
	1st irritations...	1526 cent.....0. 5	58 cent.....1.	
	2d irritations ...	490 cent.....2.	58 cent.....4.	
	3d irritations ...	490 cent.....0. 5	58 cent.....0. 5	
	4th irritations...	1526 cent.....0. 5	58 cent.....1.	
	5th irritations...	1526 cent.....0. 5	58 cent.....1.	
	167.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	**Rana esculenta.**
	1st irritations...	1725 cent.....0. 5	16 cent.....0. 5	
	2d irritations ...	1725 cent.....0. 5	16 cent.....0. 5	
	3d irritations ...	1725 cent.....0. 5	16 cent.....0. 5	
	4th irritations...	1725 cent.....0. 5	16 cent.....0. 5	
	5th irritations...	1725 cent ... 0. 5	16 cent.....0. 5	
	6th irritations...	1725 cent.....0. 5	16 cent.....0. 5	
	7th irritations...	1725 cent.....0. 5	16 cent..... 0. 5	
	8th irritations...	1725 cent.....0. 5	16 cent.....0. 5	
	9th irritations ..	1725 cent.....0. 5	16 cent.....0. 5	
	168.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	**Rana temporaria.**
	1st irritations...	2400 cent.....1.	58 cent.....2.	
	2d irritations ...	2850 cent..... 0.	58 cent.....0. 5	
	3d irritations ...	2850 cent.....0. 2	20 cent.....0. 5	
	4th irritations...	2850 cent 0. 5	10 cent.....1.	
	5th irritations...	2725 cent.....0. 5	10 cent.....1.	
	6th irritations...	2675 cent.....0.	10 cent.....1. 5	
	7th irritations...	2675 cent.....0.	10 cent.....1.	
	8th irritations...	26 8 cent.....0.	58 cent.....2.	
	9th irritations...	2618 cent.....0.	58 cent..... 2.	
	10th irritations..	2618 cent.....0.	58 cent.....1. 5	

In the following experiments the irritation produced by the opening of an electric circuit is recorded:

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
	169.			
h. m.		Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	**Rana temporaria.**
	1st irritations ...	2675 cent.....1.	10 cent.....2.	
	2d irritations....	2675 cent.....2.	10 cent.....2.	
	3d irritations....	2675 cent.....1.	10 cent.....0. 5	
	4th irritations...	2675 cent.....0.	10 cent.....0. 5	
	5th irritations...	2675 cent.....0.	10 cent.....0. 5	
	6th irritations...	2675 cent.....0.	58 cent..... 2.	
	7th irritations ..	2675 cent.....0.	58 cent.....2.	
	8th irritations...	2675 cent.....0.	58 cent.....2.	
	170.			
		Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	**Rana esculenta.**
	1st irritations...	2425 cent.....1.	50 cent.....3.	
	2d irritations....	2728 cent.....2.	50 cent.....2.	
	3d irritations....	2728 cent.....2.	10 cent... ....2.	
	4th irritations...	2728 cent.....3.	10 cent.....3.	
	5th irritations...	2728 cent.....0. 5	10 cent.....2.	
	6th irritations...	2728 cent.....1.	10 cent.....2.	
	7th irritations ..	2728 cent.....0. 2	10 cent.....0. 5	
	8th irritations...	2728 cent.....0.	10 cent.....0. 2	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**171.**	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	488 cent.....2.	55 cent.....4.	
	2d irritations....	488 cent.....0.	55 cent.....3.	
	3d irritations....	1525 cent.....2.	55 cent.....3.	
	4th irritations...	1525 cent.....2.	55 cent.....3.	
	5th irritations ..	1525 cent.....2. 5	55 cent.....3.	
	172.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	2600 cent.....2.	23 cent.....3.	
	2d irritations....	2600 cent.....2.	23 cent.....3.	
	3d irritations....	2600 cent.....2.	23 cent.....2. 5	
	4th irritations...	2600 cent.....1. 5	23 cent.....2.	
	5th irritations...	2600 cent.....1.	23 cent.....2.	
	173.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	1645 cent.....0. 5	58 cent.....0. 5	
	2d irritations....	1645 cent.....0. 5	58 cent.....0. 5	
	3d irritations....	1645 cent.....0. 5	58 cent.....0. 5	
	174.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	2605 cent.....0. 5	52 cent.....1.	
	2d irritations....	2605 cent 0. 5	52 cent.....1.	
	3d irritations....	2605 cent.....0. 5	52 cent .....1.	
	4th irritations...	2605 cent.....0. 5	50 cent.....1. 5	
	5th irritations...	2605 cent.....0. 5	50 cent.....1. 5	
	6th irritations...	1825 cent.....1.	50 cent.....2.	
	7th irritations...	1825 cent.....1.	50 cent.....1.	
	8th irritations...	1825 cent.....1.	50 cent.....2.	
	9th irritations ..	1825 cent.....1.	50 cent.....2.	
	10th irritations..	1825 cent.....1.	50 cent.....2.	
	11th irritations..	1825 cent.....0. 5	50 cent.....1.	
	12th irritations..	1825 cent.....0. 5	50 cent .....1.	
	13th irritations..	1825 cent.....0. 5	50 cent.....1.	
	14th irritations ..	1825 cent.....0. 5	50 cent.....1.	
	15th irritations..	1825 cent.....0. 5	55 cent.....1. 5	
	175.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana esculenta.
	1st irritations...	1526 cent.....0.	45 cent.....1.	
	2d irritations....	1526 cent.....0.	45 cent.....3.	
	3d irritations....	1526 cent.....0.	45 cent.....3.	
	4th irritations...	1526 cent.....0.	45 cent.....2.	
	5th irritations...	1526 cent.....0.	45 cent.....2.	
	6th irritations...	1526 cent.....0.	45 cent.....0. 5	
	7th irritations...	1526 cent.....0.	45 cent.....0. 5	
	8th irritations...	1526 cent.....0.	45 cent.....0. 5	
	9th irritations...	1000 cent.....1.	45 cent.....1. 5	
	176.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	900 cent.....0. 5	40 cent.....1. 5	
	2d irritations....	900 cent.....1.	40 cent .....1.	
	3d irritations....	900 cent.....1.	40 cent.....1.	
	4th irritations...	900 cent.....1.	40 cent.....0.	
	5th irritations...	900 cent.....0. 5	40 cent.....2.	
	6th irritations...	900 cent.....2.	40 cent.....2.	
	7th irritations...	900 cent.....2.	40 cent.....3.	
	177.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana esculenta
	1st irritations...	223 cent.....1. 5	10 cent.....3.	
	2d irritations....	223 cent.....0. 5	10 cent.....2.	
	3d irritations....	1675 cent.....1.	10 cent.....1.	

Time.	Number of experiment.	Irritation without polarization.	Irritation during polarization.	Remarks.
h. m.	**178.**	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	1500 cent.....5.	58 cent.....5.	
	2d irritations....	1500 cent.....4.	58 cent.....4.	
	3d irritations....	1500 cent.....4.	58 cent.....4.	
	4th irritations...	2350 cent.....0. 5	40 cent.....1.	
	5th irritations...	2350 cent.....1.	45 cent.....2. 5	
	6th irritations...	2000 cent.....2.	45 cent.....3.	
	179.	Irritation, 1 cell, rheochord:	Polarization, 2 cells, rheochord:	Rana temporaria.
	1st irritations...	3003 cent.....4.	25 cent.....5.	
	2d irritations....	3003 cent.....2.	25 cent.....3.	
	3d irritations....	3003 cent.....1. 5	25 cent.....1. 5	
	4th irritations...	3003 cent.....1.	47 cent.....3.	
	5th irritations...	3003 cent.....0.	52 cent.....4.	
	6th irritations...	3003 cent.....0.	10 cent.....3. 5	
	7th irritations...	3003 cent.....0.	10 cent.....1.	
	8th irritations...	3006 cent.....0.	55 cent.....2. 5	
	9th irritations...	3006 cent.....0. 5	55 cent.....2.	
	10th irritations..	3006 cent.....0. 5	10 cent.....1. 5	
	11th irritations..	2700 cent.....1.	55 cent.....3.	

Of this last series of twenty experiments not one could be used as an illustration of Pflüger's theory, and almost all of them gave results directly opposite to what is demanded by this theory. In fifteen of the experiments the polarizing current usually produced an increased excitability of the nerves.

Thus far one hundred and seventy-eight new experiments have been recorded in this paper, in but seventy-two of which was the theory of Pflüger confirmed. This result convinced me that this theory could not be true except in a modified state. For, if true, how will the directly opposite results obtained in over one-half my experiments be explained. Yet, as in so many of my experiments an increased excitability was found in the katelectrotonic portion of the nerve, or a decreased excitability in the anelectrotonic portion, I could not but believe that a grain of truth was mingled with the peck of chaff which has been given us as orthodox truth in the books of physiology under the name of "Pflüger's Laws of Electrotonus." The "grain of truth" consisted in the fact that this condition sometimes did occur, and it was therefore necessary to determine why it is not always present.

On looking more carefully over my experiments it occurred to me that *the effect of irritating a polarized nerve is influenced by the strength of the polarizing and irritating currents.* The experiments of Budge*, Munk†, and Schiff and Herzen‡ have already shown that the strengths of the currents did in some way influence the effect of the polarization on the excitability of the nerve, but no one has thought of using this fact to explain the varying results obtained by irritating a polarized nerve.

For illustrations of this fact as respects the strengths of the polarizing currents *vide* experiments 9 (irritations 2, 3, and 4), 11, 26 (irritations 27 to 32), 28 (irritations 18 to 30), 46 (irritations 3 and 4), 52 (irritations 1 and 2), 53 (irritations 1 to 5), 58, 118, 121, 160, &c.

*Loc. cit. †Loc. cit. ‡Loc. cit.

In illustration of the fact that the strength of the irritating current influences the effect of the polarizing current on the excitability of nerves *vide* experiments 12, 13, 14, 16, 22, 26, 28, 43, 127, &c.

May not the extent of muscular contractions produced by the irritation of a polarized nerve be largely due to the proportion between the strengths of the two currents?

In the first experiments made in answer to this question the irritations were made by means of an induction apparatus, the non-polarizable electrodes being, however, still adhered to. The polarizing current, whose strength was never changed, was produced by a single Leclanche cell. In these experiments I found that when the strength of irritation produced a minimal contraction—no weight being attached to the myograph—both the ascending and descending polarizing current produced an increased irritability of the nerve to the side of the anode as well as to the side of the kathode. With a somewhat stronger induction current, or, what amounted to the same thing, by attaching a weight to the myograph, and then observing the minimal contractions, the results of Pflüger were obtained; that the polarizing current produced an increased excitability of the nerve to the side of the kathode and a decreased excitability to the side of the anode. By still further increasing the strength of the irritation the results of Eckhard were obtained—a decreased excitability of the nerve to the side of the kathode as well as to the side of the anode.

Illustrative experiments.

Number of experiment.	Irritation alone.		Irritation during polarization.	Remarks.
	Strength of current.	Contraction.		
	cent.	*mm.*	*mm.*	
180.			Descending polarization:	Rana esculenta.
1st irritations	24.	6. 5	.....	In these experiments 0. cent represents the strongest possible irritation.
2d irritations	24.	.....	Contraction.....13. 5	
3d irritations	24.	6. 4	Contraction.....13. 5	
4th irritations	24.	14.	Contraction.....17.	30 minutes later.
5th irritations	24.	9.	Contraction.....14.	
181.			Ascending polarization:	Rana esculenta.
1st irritations	13.	10.	Contraction.....13.	
2d irritations	13.	11. 9	Contraction..... 15.	
3d irritations	14.	10. 1	Contraction.....11. 4	
4th irritations	14.	11.	Contraction.....11. 6	
5th irritations	14. 5	0.	Contraction.....11.	
6th irritations	15.	0.	Contraction..... 3. 5	
7th irritations	15.	0.	Contraction..... 8. 6	
8th irritations	9.	9. 5	Contraction..... 7. 9	
9th irritations	9.	9. 1	Contraction..... 5. 5	
10th irritations	0.	5. 5	Contraction..... 0.	
182.			Ascending polarization:	Rana esculenta.
1st irritations	8.	0.	.....	
2d irritations	8.	.....	Contraction..... 8. 6	
3d irritations	6.	5. 6	.....	

Illustrative experiments—Continued.

Number of experiment.	Irritation alone.		Irritation during polarization.	Remarks.
	Strength of current.	Contraction.		
	cent.	*mm.*		
4th irritations	6.	.....	Contraction.....10.	
5th irritations	6.	9.	.....	
183.				
			Descending polarization:	Last preparation again used.
1st irritations	6.	4.	.....	
2d irritations	6.	4.	Contraction..... 5.9	
3d irritations	6.	.....	Contraction..... 5.9	
4th irritations	6.	6.5	.....	
5th irritations	6.	.....	Contraction..... 7.1	
184.				
			Ascending polarization:	Rana esculenta. 10 grammes weight attached.
1st irritations	13.5	6.7	.....	
2d irritations	13.5	.....	Contraction..... 6.2	
3d irritations	8.5	6.5	.....	
4th irritations	8.5	.....	Contraction..... 6.1	
5th irritations	8.5	8.1	.....	
6th irritations	8.5	.....	Contraction..... 6.	
7th irritations	8.5	14.	.....	Weight reduced to 2 grammes.
8th irritations	8.5	.....	Contraction..... 8.5	
9th irritations	8.5	13.	.....	
10th irritations	10.5	8.6	.....	
11th irritations	10.5	.....	Contraction..... 2.	
12th irritations	11.	3.5	.....	
13th irritations	11.	.....	Contraction..... 5.9	
14th irritations	18	3.5	.....	Another portion of the nerve irritated.
15th irritations	18	.....	Contraction..... 2.5	
16th irritations	18	3.	.....	
17th Irritations	18	.....	Contraction..... 3.5	
18th irritations	18.5	2.5	.....	
19th irritations	18.5	.....	Contraction..... 3.5	
20th irritations	19.5	1.5	.....	
21st irritations	19.5	.....	Contraction..... 2.6	
22d irritations	19.5	2.	.....	
23d irritations	20.	0.	.....	
24th irritations	20.	.....	Contraction..... 4.3	
25th irritations	20.	0.	.....	
26th irritations	20.	.....	Contraction..... 1.5	
27th irritations	20.	1.	.....	
28th irritations	20.	.....	Contraction..... 5.5	
29th irritations	8.	3.	.....	Weight increased to 10 grammes.
30th irritations	8.	.....	Contraction..... 2.6	
31st irritations	14.	1.	.....	
32d irritations	14.	.....	Contraction..... 0.2	
33d irritations	14.	2.5	.....	
34th irritations	14.	.....	Contraction..... 1.8	
35th irritations	14.	2.	.....	
36th irritations	14.	.....	Contraction..... 0.	
185.				
			Ascending polarization:	Rana esculenta. 2 grammes weight attached to muscle.
1st irritations	10.5	0.	.....	
2d irritations	10.5	.....	Contraction..... 6.9	
3d irritations	10.5	0.	.....	
4th irritations	9.5	1.5	.....	
5th irritations	9.5	.....	Contraction..... 6.8	
6th irritations	9.5	0.	.....	
7th irritations	9.5	.....	Contraction..... 6.8	
8th irritations	9.	0.	.....	
9th irritations	9.	.....	Contraction..... 3.6	
10th irritations	9.	0.	.....	
11th irritations	9.	.....	Contraction..... 6.5	
12th irritations	4.5	3.6	.....	Weight, 10 grammes.
13th irritations	4.5	.....	Contraction..... 3.6	
14th irritations	4.5	3.5	.....	
15th irritations	4.5	.....	Contraction..... 3.5	
16th irritations	0.	4.	.....	
17th irritations	0.	.....	Contraction..... 3.5	
18th irritations	0.	3.5	.....	
19th irritations	0.	.....	Contraction..... 2.7	
20th irritations	0.	3.3	.....	

The next series of experiments was made with the assistance of the apparatus before described, with the addition of a Marey myograph to write the strength of the contractions. The results obtained were similar to those obtained when the irritations were made by means of the induced current. The supposition that the effect of a constant current on the excitability of the nerves can be modified by changing the strength of the irritation employed being settled in the affirmative, it seemed very probable that a change in the strength of the polarizing current could produce a similar effect. This was also found to be so in a long series of experiments. It was also determined that the effect of a polarizing current may change after a varying period of time, so that it will take a stronger current (the irritation remaining the same) to cause the same relation to be produced between the contractions from the irritation of the non-polarized and polarized nerves as was produced in an earlier stage of the experiment.

A few of these experiments are here given as illustrations. They, I think, will set this vexed question in nervous physiology at rest. For, as results from these experiments, the excitability of a polarized nerve can be increased or decreased at will, not only by changing the direction of the current, but also by changing the intensities of the currents, these two facts must in conjunction form a law.

The excitability of a polarized nerve is determined by the proportion existing between the strengths of the polarizing and irritating currents. With certain proportions of the strengths of these currents the excitability of the anelectrotonic portion of the nerve is reversely influenced from that of the katelectrotonic portion.

EXPERIMENT 186.

Irritation alone.		Irritation plus polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
		1 Daniel:		
1 small Daniel	6.	Rheochord.....38	6.2	An ascending polarizing current applied 6mm above a descending irritating current.
	5.4	.....do 38	6.2	
	6.4	.....do 38	24.6	
	19.5	.....do 38	21.2	
	6.1	.....do 38	22.8	
	5.8	.....do 33	14.2	
	6.	.....do 33	22.1	
	13.8	.....do 33	20.2	
	4.8	.....do 48	21.4	
	6.6	.....do 48	20.8	
	6.4	.....do 48	21.3	
	20.2	.....do 53	6.2	
	19.2	.....do 53	16.6	
	12.2	.....do 53	6.2	
	14.8	.....do 33	20.6	
	13.9	.....do 33	15.4	
	13.5	.....do 33	14.1	
	12.1	.....do 33	15.8	
	14.8	.....do 56	14.8	
	16.	.....do 56	14.3	
	9.	.....do 56	14.2	
	13.8	.....do 56	10.8	
1 cell	12.8	1 cell	1.9	
	12.6	do	4.2	
	13.3	do	2.8	
	13.	do	3.1	

In the above experiment the descending irritating current was kept of the same strength throughout. In the beginning, while the ascending polarizing current was weak, it produced an increased excitability of the nerve. When, however, it was increased to "rheochord 53," Pflüger's result (*i. e.*, a diminished excitability) was obtained, which became more marked when the polarizing current was increased to 1 cell. A curious phenomenon was observed which is to be seen, to a greater or less degree, in all the experiments. In the beginning "rheochord 33" produced an increased excitability of the nerve, while thirteen irritations later it produced the opposite effect. So it must be concluded that the preparation becoming older causes the effect of a polarizing current of a certain strength on the excitability of the nerve to change. This will explain the result obtained by Schiff and Herzen. These investigators found that while in the beginning of an experiment on the excitability of polarized nerves they might obtain certain results, 15 or 30 minutes later entirely different results were obtained.

EXPERIMENT 187.

Irritation alone.		Irritation plus polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
		1 Daniel cell:		
1 Daniel	16.1	Rheochord.....38	29.2	A descending polarising current 8mm. above a descending irritating current.
Rheochord..... 691	8.8		28.4	
	5.5		14.4	
	17.3		24.3	
	5.5		11.	Rana temporaria
	12.2		14.5	
Rheochord.....1308	3.8		3.8	
	3.8		3.8	
	3.8		3.8	
Rheochord.....1214	4.2		0.	
	2.1		0.	
	5.1		0.	
Rheochord.....1009	1.6		0.	
	10.1		0.	
	7.2		0.	
	8.2		4.9	
1 Daniel	18.9	1 Daniel	10.2	
Rheochord..... 188	16.1	Rheochord.....38	12.6	
1 Daniel	9.	Rheochord..... 33	8.2	
	15.5		15.9	
	8.2		26.2	
	12.1		25.1	
	21.	Rheochord.....38	8.2	
	31.1		8.2	
	10.		8.2	
	14.9		9.2	
2 Daniel cells	0.		7.8	
	22.2		14.1	
	16.5		7.5	
	33.5		31.	
	37.		7.2	
	7.2	Rheochord.....48	10.3	
	12.1		12.1	
	29.4		14.3	
	28.6		14.1	
	6.7	Rheochord.....56	22.1	
	6.4		7.6	
	3.2		13.4	
	11.1		8.	
	3.2		3.5	
1 Daniel	29.9	1 Daniel	6.3	
Rheochord.....1009	29.	Rheochord.....38	0.	
	8.		0.	
	4.4		0.	

EXPERIMENT 187—Continued.

Irritation alone.		Irritation plus polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
Rheochord..... 789	3.2		8.9	
	2 6		10.3	
	5.5		11.8	
	4.		13.1	
	5.1		8.3	
Rheochord..... 691	5.		19.6	
	5.8		11.2	
	2.		4.5	
	10.1		11.6	
	0.		4.	
	0.		3.5	
Rheochord..... 488	4.		4.	
	3.6		3.4	
	3.6		3.4	
	7.2		4.	
Rheochord..... 223	4.5		4.	
	4.8		4.	
	4.		4.	
Rheochord..... 188	8.7		3.8	
	9.5		7.9	
2 Daniels	3.2	1 Daniel	3.2	
	3.2	Rheochord.....53	3.2	
	10.1	Rheochord.....48	3.4	
	13.3		3.	
	7.2		3.1	
1 Daniel	3.1		7.4	
	3.		7.1	
	3.		7.2	
	2.5	Rheochord.....50	7.	
	2.1		7.2	
	2.		12.	

In this experiment a descending polarizing current of a given strength (1 Daniel cell, "rheochord 38"), and an irritating current from 1 Daniel, "rheochord 691," produced an increased excitability of the nerve to the side of the kathode (Pflüger's result.) But when the irritating current was reduced in strength to 1 Daniel, "rheochord 1308," the influence of the polarizing current on the excitability of the nerve was annihilated, and we had the same contraction resulting from the irritation alone as from the irritation and polarization in conjunction. With the irritating current somewhat stronger (1 Daniel, "rheochord 1214," and "rheochord 1009"), the polarizing current absolutely paralyzed the effect of the irritating current. Increasing this latter current still more, the polarization had a varying influence on the effect of the irritation. When, however, the polarizing current was now decreased in strength (to 1 Daniel, "rheochord 56"),the polarizing current again caused the nerve to become more excitable. The same effect was attained with the former polarization current ("rheochord 38") by using an irritating current of 1 Daniel, "rheochord 789" or "rheochord 691." With a stronger irritating current the polarized nerve was less excitable than the non-polarized nerve. This corresponds to the result obtainedby Nobili, Matteucci, Valentin, and Eckhard, who always employed comparatively strong currents. Using a polarizing current of 1 Daniel, "rheochord 48," or "rheochord 50" strength, with the irritation of 1 or 2 Daniel cells, the former always increased the excitability of the nerve.

EXPERIMENT 188.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the contraction.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
2 Daniels	3.5	1 Daniel	1.4	An ascending polarizing current above a descending irritating current.
Rheochord.....1413	5.	Rheochord.....53	4.8	
	10.		0.	
	12.5		0.	
	4.7		6.	Descending polarization.
	0.		4.	
	3.1		4.	
	3.7		5.	
	4.9	Rheochord.....57	4.9	
	4.9		4.9	
	4.9		4.9	
	5.	1 Daniel	10.2	Ascending polarization.
	5.2	Rheochord..... 6	8.4	
	5.4		7.5	
	6.5		9.5	Descending polarization.
	4.		5.6	
	5.4		9.4	
1 Daniel	1.2	Rheochord.....10	1.5	Ascending polarization.
Rheochord.....1109	1.1		1.6	
	1.5		1.6	
	1.1		0.	
	1.3		0.	Descending polarization.
	1.5		0.	
	2.5	3 Daniels	0.	
	2.1		0.6	
	1.9		0.	
	2.6		0.	Descending polarization.
	3.1		0.	
	2.5		0.	
	1.3	2 Daniels	0.	
	2.4		0.	
	1.8		0.	
	1.	1 Daniel	4.5	
	1.		4.4	
	3.5		4.7	

In experiment 188, with a descending irritating current of 2 Daniel cells, "rheochord 1413," an ascending polarizing current, Daniel, "rheochord 53" usually produced a decreased excitability of the nerve. With a descending polarizing current of the same strength the opposite effect was obtained. Increasing this current to "rheochord 57," it failed to influence the effect of the irritation. A polarizing current of 1 Daniel, "rheochord 6," passing in either direction, increased the excitability of the nerve. With an irritating current derived from 1 Daniel, "rheochord 1109," an ascending polarizing current from 1 Daniel, "rheochord 10," still slightly increased the excitability. When with the same strength of currents the polarization was descending, this latter always abolished the effect of the irritation. The latter effect always occurred when the polarizing current was increased to 2 or 3 Daniels. When but 1 Daniel was used for the descending polarization, this produced increased excitability of the nerve.

EXPERIMENT 189.

Irritation alone.		Irritation with polarization.		Observations.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
		1 Daniel:		
1 Daniel	3.2	Rheochord.....57	5.1	Descending polarizing current.
	4.8		7.3	
	4.2		7.	Descending irritating current.
	5.1	Rheochord.....48	5.1	
	5.1		5.1	Rana temporaria.
	5.1		5.	
	9.	Rheochord.....43	5.8	
	10.1		6.	
	10.1		4.9	
	11.9		5.	
	7.1		3.5	Descending polarizing current.
	8.		6.1	
	9.1		6.1	
	9.2		7.3	
	3.	Rheochord..... 28	3.4	
	5.		7.8	
	0.		7.2	
	4.		7.1	
	1.9		7.8	
	7.		5.5	Ascending polarizing current.
	7.1		6.2	
	7.6		6.6	
	7.8		0.	
	7.		0.	
	8.9		1.4	
	7.		6.1	
	7.2		5.9	
	7.3	Rheochord.....18	7.3	Descending polarizing current.
	6.		6.	
	6.		6.	
	6.		6.	
	6.		6.	
	7.1		5.2	Ascending polarizing current.
	5.3		3.1	
	6.2		5.	
	7.	Rheochord.....8	5.9	
	6.1		6.1	
	4.5		0.6	
	5.		1.9	
	5.1		2.4	
	0.4		7.	Descending polarizing current.
	0.		4.3	
	0.5		7.9	
	0.3		5.8	
	3.1	2 Daniels	0.	
	4.2		0.	
	3.1		0.	
	4.2		0.5	Ascending polarizing current.
	4.5		0.6	
	4.4		0.5	
	1.5	Rheochord.....8	0.	
	4.2		0.	
	3.1		1.2	
	0.		3.	Descending polarizing current.
	0.		4.	
	0.		2.8	

In experiment 189 the descending irritating current was kept of the same strength (1 Daniel cell) throughout the experiment. With descending polarization, 1 Daniel, "rheochord 57," the excitability of the nerve was increased. With 1 Daniel, "rheochord 48," the excitability remained unaffected. Further increasing the strength of the polarizing current to "rheochord 28," an increased excitability is produced for the descending current and increased for the ascending. On increasing it still further to "rheochord 18," the excitability of the nerve remained uninfluenced by the descending constant current. A polarizing current of still greater strength diminished the excitability of the nerve.

EXPERIMENT No. 190.

Irritation alone.		Irritation with polarization.		Observations.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
		1 Daniel:		
2 Daniels	16. 7	Rheochord.....55	9. 8	Ascending polarizing current.
	15. 9		11. 7	
	16		15. 4	Descending irritating current.
1 Daniel:				
Rheochord.....1261	9.		0.	
	11. 2		0.	Rana temporaria.
	11. 8		10. 8	
	11. 3		10. 4	
	9.		11. 2	Descending polarizing current.
	8. 2		9. 1	
	7. 5		9. 2	
	10. 8	Rheochord.....53	11. 6	
	0.		14. 1	
	0.		7. 4	
	0.		6.	
Rheochord.....1059	10. 2		7. 3	
	6. 2		6. 2	
	10.		12. 1	
	10. 1		10.	
	10. 1		7. 2	Ascending polarizing current.
	10. 8		7. 6	
	9. 3		6. 1	
	10. 1		1. 5	
	5. 2		0.	
	1. 4		0.	
	0. 9		0.	
	5.		8. 9	Descending polarizing current.
	4. 1		5. 3	
	0. 7		1. 2	
	1. 9		8. 1	
Rheochord..... 440	0.	Rheochord.....43	1.	Ascending polarizing current.
	0.		8. 8	
	0.		4. 4	
	3. 1		8. 9	
	0. 3		8. 1	
	1.		7. 4	
	2.	Rheochord..... 56	1. 9	
	2.		0. 9	
	2.		0.	
2 Daniels:				
Rheochord..... 223	5. 4		1. 2	
	1. 8		1.	
	1.		0.	
1 Daniel	9.	Rheochord.....38	9.	
	8. 1		8. 1	
	9. 1		9.	
	3.		6. 9	
	4. 1		7. 6	
	3. 4		8. 4	
	9 1	Rheochord.....43	5.	
	10. 6		4. 1	
	10. 2		4.	
	4.	Rheochord.....38	7. 2	
	5. 1		6. 1	
	5. 5	Rheochord 33	6.	
	3. 2		5. 1	
	3. 2		5. 1	
	3. 1		5.	
	3. 2	Rheochord.....23	7. 1	
	2. 1		6. 9	
	3. 9		7.	
	4. 9	Rheochord 13	5. 6	
	4. 7		5. 1	
	4. 5		5. 6	
	4. 1		5. 7	
	4. 8	Rheochord..... 4	4. 8	
	4. 8		4. 8	
	4. 8		4. 8	
	4. 5	1 Daniel	6. 4	
	4. 2		7. 5	
	2. 9		4. 2	
	4. 8	2 Daniels	4.	
	4. 8		4. 9	
	3. 6		4. 5	

EXPERIMENT No. 190—Continued.

Irritation alone.		Irritation with polarization.		Observations.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
	4.5	3 Daniels	0.	
	4.2		0.	
	6.		0.	
	5.1		0.	
	1.5	Rheochord.....43	6.9	
	1.5		5.	
	2.4		5.8	
	4.	Rheochord.....38	3.2	
	6.1		0.	
	3.4		0.	
	4.		0.	

In the preceding experiment descending irritating currents with both ascending and descending polarizing currents were used. When an ascending polarizing current from 1 Daniel, "rheochord 55," and irritating currents from 2 Daniels or 1 Daniel, "rheochord 1261," were used, the effect of the irritation was diminished by the polarization. With the same strengths of currents, but with a descending instead of an ascending polarizing current, the opposite effect was produced. That is, under these circumstances there was diminished excitability in the anelectrotonic and increased excitability of the nerve in the katelectrotonic phase—Pflüger's result. When, now, this irritating current was increased to 1 Daniel, "rheochord 1059," both the descending and ascending polarizing currents diminished the excitability of the nerve. After some minutes, however, with the same currents, augmented excitability occurred in the katelectrotonic phase. With polarization, 1 Daniel, "rheochord 43," and irritation, 1 Daniel, "rheochord 440," the ascending polarizing current produced an increased excitability. Decreasing the strength of the polarizing current to 1 Daniel, "rheochord 56," the opposite effect was produced. With an irritating current from 1 Daniel cell, an ascending polarizing current from 1 Daniel, "rheochord 38," at first fails to affect the excitability of the nerve, but later increases it. With the same irritation, a polarizing current from 1 Daniel, "rheochord 43," produces an increased excitability of the nerve. The irritation being the same, an ascending polarizing current from 1 Daniel, "rheochord 4," does not in the least affect the excitability of the nerve. With a polarizing current from 1 Daniel and an irritating current of the same strength, the effect of the latter is increased during the presence of the former. The effect of the same irritating current is, however, absolutely annihilated by an ascending polarizing current from 3 Daniel cells. After this it was found that the effect of an irritation (1 Daniel) was increased by an ascending polarizing current from 1 Daniel, "rheochord 43," which earlier in the experiment had the opposite effect. The very opposite result was obtained with irritation, 1 Daniel, and polarization, 1 Daniel, "rheochord 38."

EXPERIMENT 191.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
		1 Daniel:		
1 Daniel	7.	Rheochord 56	7.	Rana esculenta. Descending irritating current applied to the nerve below an ascending polarizing current.
	7.		7.	
	7.1		7.1	
	7.		7.	
	7.		7.	
	5.6	53	1.2	
	4.		1.9	
	4.		0.	
	6.1		0.	
	10.2		7.	
	7.6		2.	
	9.4		0.8	
	6.9		0.	
	7.3	48	6.2	
	6.1		0.	
	5.9		0.	
	4.5		0.	
	6.3		0.	
	0.	43	5.8	
	0.		5.9	
	0.		5.4	
	4.8		5.	
	0.		5.3	
	0.		5.4	
	0.		1.7	
	0.		7.4	
	4.2		13.4	
	3.6	38	13.6	
	2.4		10.3	
	0.	28	5.2	
	0.		4.8	
	0.		5.3	
	0.	18	1.	
	0.		0.9	
	0.		1.2	
	1.8		5.2	
	2.5	8	4.2	
	3.4		4.2	
	4.2		5.	
	2.1	4	0.	
	1.8		0.	
	3.2		0.	
	2.2		0.	
	6.4		2.3	
	1.	18	1.4	
	3.		4.1	
	1.2		10.1	
	2.		4.5	
	3.1	4	3.2	
	2.		2.8	
	3.1		3.2	
	4.	1 Daniel	0.	
	1.2		0.	
	0.8		0.	
	0.5		0.	
	2.4		0.	
	4.1	2 Daniels	3.9	
	4.1		2.8	
	7.2		3.3	
	1.		0.	
	1.		0.	
	5.4	3 Daniels	0.	
	1.2		0.	
	1.8	4 Daniels	0.	
	1.8		0.	
	2.7	6 Daniels	0.	
	2.8		0.	
	0.	1 Daniel	5.2	
	1.4		7.3	
	3.4	Rheochord.....18	5.1	
	2.2		7.1	
	2.4		4.	

The polarizing current used in the preceding experiment passed in an ascending direction, while a descending irritating current was applied to the nerve below it. When the former was of the strength of 1 Daniel, "rheochord 56," it failed to influence the effect of an irritating current derived from 1 Daniel cell. When, however, the strength of the former current was increased to "rheochord" 53 or 48, it produced a diminished excitability of the nerve; but with "rheochord" 43, 38, 28, 18, or 8, the opposite effect was produced. With "rheochord 4" a diminished excitability was produced. The same result was obtained when the polarizing current was increased to 1, 2, 3, 4, or 6 Daniels. A polarizing current of 1 Daniel, "rheochord 18," again produced an augmented excitability of the nerve.

EXPERIMENT 192.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
		1 Daniel:		
1 Daniel	5.8	Rheochord..... 3	5.8	Rana temporaria. A descending irritating current applied to the sciatic nerve below a descending polarizing current.
	5.8		5.8	
	5.8		5.8	
	5.8		5.8	
	5.8		6.9	
	4.4	2 Daniels	0.	
	3 7	1 Daniel:	0.	
	0.	Rheochord..... 38	6.2	
	0.		4.2	
	3.9		4.2	
	3.5	1 Daniel:	5.	
	4.2	Rheochord 28	4.4	
	4.		4.2	
	0.4		4.	
	4.		4.	
	3.9	23	3.9	
	2.2		3.8	
	3.3		2.4	
	3.4	48	3.	
	2.8		2.8	
	3.		3.	
	5.	Rheochord.....18	2.6	
	1.5		0.	
	1.5		0.	
	4.2		0.	
	3.	8	2.4	
	3.1		1.2	
	2.9		1.4	
	3.2		2.1	
	0.		3.	
	0.		1.8	
	0.		1.5	
	0.		4.	
	0.		2.8	

In the foregoing experiment the descending irritating current was kept of one strength throughout the experiment. In the beginning it remained unaffected by a polarizing current from 1 Daniel, "rheochord 55," but the contractions which it produced were prevented by a polarizing current of 2 Daniels. A polarizing current of 1 Daniel, "rheochord 38," increased the excitability, while still further increasing this current to "rheochord 8" almost annihilated the effects of the irritation.

EXPERIMENT 193.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
		1 Daniel:		
1 Daniel:	13. 1	Rheochord.....56	14. 9	Rana temporaria. A descending irritating current applied to the nerve below an ascending polarizing current.
	12. 6		14. 7	
	13.		15. 9	
	13. 9		14 1	
	12. 8	48	14.	
	13. 5		13. 5	
	13.		13. 5	
	13. 1	43	13. 1	
	13.		13.	
	14.	38	14.	
	13. 4		13. 5	
	13.		12. 1	
	13. 9	28	13. 9	
	14.		13.	
	13. 2		11. 9	
	11. 5		11.	

As a general rule, in this experiment an increased excitability of the nerve was produced of an ascending polarizing current of the anode to the side.

EXPERIMENT 194.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.		*mm.*	
1 Daniel	5.	1 Daniel	9. 9	Rana temporaria. A descending irritating current applied to the nerve below an ascending polarizing current.
	7. 4		12. 5	
	7.		11. 8	
1 Daniel	10.	2 Daniels	10.	Descending polarizing current.
	10.		10.	
	10.		10.	
	9. 8		9. 8	
1 Daniel	8.	2 Daniels	0.	Ascending polarizing current.
	7. 8		0.	
	9. 1		0. 9	
	9.		2. 4	
1 Daniel	6. 9	1 Daniel	4. 2	
	6. 9		5. 1	
	9.		7. 1	
	9. 1		3.	
	5. 6		0.	
1 Daniel	5. 1	1 Daniel	5. 1	Descending polarizing current.
	5. 1		5. 1	
	5. 1		5. 1	
	5. 1		0.	Ascending polarizing current.
	5. 1		2. 3	
	5.		1. 7	

An ascending polarizing current decreased the excitability of the nerve when both currents were of the same strength (1 Daniel). A descending polarizing current failed to influence the height of the contractions when the irritating current was derived from 1 and the polarizing current from 2 Daniels, but an ascending polarizing current under these circumstances again diminished the excitability of the nerve. With each of the currents derived from 1 Daniel, the descending polarization failed to influence the height of the contractions.

EXPERIMENT 195.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
1 Daniel:		1 Daniel:		
Rheochord.....1109	1.8	Rheochord.....10	1.8	Rana esculenta. A descending irritating current applied to the nerve below an ascending polarizing current.
	1.8		i.8	
	1.8		1.8	
	1.8	10	1.8	Descending polarizing current.
	1.8		1.8	
	0.2		1.	
	0.		1.	
	0.		1.	
	0.6	16	0.	Ascending polarization.
	0.7		0.	
	0.7		0.	
	0.4		0.	

An irritating current derived from 1 Daniel, "rheochord 1109," produced the same effect when the nerve was polarized in either direction with a current derived from 1 Daniel. With a current derived from 1 Daniel, "rheochord 10," the excitability of the nerve was increased to the side of the kathode. In the positive phase of a current derived from 1 Daniel, "rheochord 16," the excitability of the nerve was abolished for an irritating current derived from 1 Daniel, "rheochord 1109."

EXPERIMENT 196.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
1 Daniel:		1 Daniel:		
Rheochord	14.1	Rheochord.....56	14.1	Rana esculenta. A descending irritating current below a descending constant current.
	14.1		14.1	
	14.1		14.1	
	5.2	55	15.5	
	12.2		19.	
	14.1		24 3	
	12.1	56	8.	
	21.2		10.9	
	12.		10.4	
	26.9		10.8	
	23.6		13.8	
	10.9		10.9	
	10.9	48	8.2	
	10.9		4.9	
	8.1		11.2	
	8.1		0.	
	10.4		0.	
	4.1		0.	
	9.		9.	
	8.7	38	10.9	
	1.5		9.2	
	3.6	Rheochord.....38	7.1	
	0.		3.2	
	13.9	48	7.9	
	8.1		7.0	
	8.1		6.4	
	8.6		19.6	
2 Daniels	8.	48	12.1	
	6.6		13.6	
	7.8		21.6	
	3.2			

EXPERIMENT 196—Continued.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
	mm.	*cent.*	*mm.*	
1 Daniel	15. 2	Rheochord 48	13. 1	
	11.		1. 2	
	3. 8		0.	
	2. 4		0.	
	4.		0.	
	0.	28	5. 5	
	2. 2		5. 3	
	3.		4. 1	
	0.	1 Daniel	0. 8	
	0.		1. 1	
	0.		1.	
		5 Daniels:		
1 Daniel	5.	Rheochord	5.	
	5.		5.	
	5.		5.	
	5.	2 Daniels	5.	
	5.		5.	
	5.		5.	
	5.		5.	
1 Daniel	0.	1 Daniel	4. 2	
	4.		12. 4	

In the preceding experiment descending irritating and descending polarizing currents were employed throughout. The results obtained were similar to those obtained in the previous experiments.

EXPERIMENT 197.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
1 Daniel:		1 Daniel:		
Rheochord.....223	2. 5	Rheochord.....38	6.	Rana esculenta. A descending irritating current applied to the nerve below an ascending polarizing current.
	6.		10. 3	
645	2.		0.	
	1. 8		0.	
	3. 7		0.	
	2. 9		0.	
740	0. 8		2. 1	
	0.		6. 1	
	0. 6		5. 6	
	0. 8		5. 1	
838	5. 1		3. 8	
	5.		1.	
	4. 9		2. 2	
	3.		0. 4	
	2. 2		0.	
949	4.		5. 5	
	2. 2		2. 1	
	2. 1		0. 2	
	0. 8		1. 8	
	0.		3.	

EXPERIMENT 198.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
2 Daniels	5.6	2 Daniels	5.6	Rana temporaria. A descending irritating current applied to the nerve below a descending polarizing current.
	5.6		5.6	
	5.6		5.6	
	9.8		5.4	Ascending polarization.
	6.5		0.	
	6.6		4.4	
	9.4		3.9	
2 Daniels	6.4	3 Daniels	1.6	
	11.0		0.	
	5.8		0.	
	6.2		0.	
	6.		5.5	Descending polarization.
	9.2		5.4	
	5.7		0.	
	5.5		0.	
	5.6		0.	
2 Daniels	5.	1 Daniel	5.	
	5.		5.	
	2.3		6.1	Weighted muscle with 8 grammes.
	2.4		5.6	
	2.		5.	
	5.1		5.	Weight removed.
2 Daniels	4.5	1 Daniel	0.	Ascending polarization.
	4.5		0.	
	4.6		0.	
	5.2		0.	
	0.5		2.7	Weighted 10 grammes.
	0.7		2.9	
	0.5		2.4	
2 Daniels	5.	3 Daniels	1.5	Removed the weight.
	4.7		2.4	
	5.1		0.	
	5.		0.	
	4.9		0.	
	4.9		0.	Descending polarization.
	4.9		0.	
	4.9		0.	
	4.9		0.	
2 Daniels	2.2	1 Daniel	4.5	
	0.		5.1	
	0.		5.	

It will be seen in this experiment that, when on one occasion diminished excitability of the nerve resulted from the application of the descending polarizating current to the nerve attached to a non-weighted muscle, increased excitability was produced when the muscle was weighted. Again, later, when ascending polarization produced "paresis" of the nerve, attaching a weight to the muscle sufficed to bring about the opposite result.

Weighting the muscle, therefore, influences the effect of polarization on the excitability of the nerve.

EXPERIMENT 199.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
2 Daniels: Rheochord.....2127	0.	1 Daniel	8. 5	Rana temporaria. A descending irritating current above an ascending polarizing current.
	0.		8. 5	
1893	0.		9. 5	
	0.		8. 5	
1413	0.		9. 5	
	0.		10. 1	
	2. 4		11.	
	0.		9. 6	
1009	7. 6		7. 5	
	5. 4		2.	
	10. 9		0.	
	10. 9		0.	
	14.		0.	
1618	0.		11. 5	Descending polarization.
	0.		7.	
	0.		10.	
2 Daniels	10. 5		10. 5	
	10. 5		10. 5	
	11.	2 Daniels	7. 5	
	11. 2		0.	
	11. 6		1. 1	
	10. 5		0.	
	12.		0.	
	11.		0.	Ascending polarization.
	13. 9		0.	
	9. 9		7.	
	9. 5		6. 4	
	9.		4. 2	

EXPERIMENT 200.

		1 Daniel:		
2 Daniels	14. 5	Rheochord.....54	14. 5	Rana temporaria. A descending irritating current below an ascending polarizing current.
	21.		20. 6	
	20. 6		20. 6	
	11. 5	48	12.	
	11. 8		12.	
	12. 4	54	11. 9	
	12. 8		11. 8	
	11. 9		11. 9	
	12. 4	48	12. 4	Descending polarization.
	12. 3		12. 4	
	12. 4		12. 4	
	12. 3		12. 3	
	12. 1		12. 3	
2 Daniels	11. 5	3 Daniels	0.	Ascending polarization.
	11. 5		0.	
	10. 9		0.	
	10. 7		0.	
	8.		3. 5	Descending polarization.
	8. 4		3. 6	
2 Daniels	8.	2 Daniels	2. 5	
	9. 9		8. 4	
1 Daniel	10.	3 Daniels	0.	
	9. 4		0.	
	10. 2		0.	
	9. 7		2.	
	12.		0.	Ascending polarization.
	4. 5		0.	
	4.		0.	
	2.	2 Daniels	1.	Descending polarization.
	9. 1		0.	
	8. 7		0.	
	9. 1		0.	
	9.		5. 6	
	10.		0.	Ascending polarization.
	14. 2		0.	
2 Daniels	9.		9.	Descending polarization.
	9.		9.	
	9.		9.	
	8. 7		8. 7	
	8. 7		8. 7	

EXPERIMENT 200—Continued.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
	10.6	Rheochord.....6	9.2	Ascending polarization.
	10.6		3.6	
	7.9		5.4	
	8.6		0.	
	10.1		0.	
	6.		8.1	Descending polarization.
	4.2		8.4	
	5.8		9.5	
	3.9		14.2	

EXPERIMENT 201.

		2 Daniels:		
1 Daniel	9.5	Rheochord.....55	11.5	Rana temporaria. A descending irritating current applied to the nerve below an ascending polarizing current.
	10.		9.5	
	9.		9.2	
	9.		9.	
	12.		12.	
	8.5		10.6	
	8.5		9.	Descending polarization.
	8.2		10.5	
	8.2	48	8.2	Ascending polarization.
	8.2		12.	
	8.	38	8.	
	10.2		10.1	
	8.		8.	
	8.	28	8.	
	8.		8.	
	10.	23	10.4	Descending polarization.
	8.		10.4	
	8.		10.5	
	8.		8.	
	7.5	12	11.5	
	7.5		8.2	
	0.		11.6	
	0.		8.	
	0.		8.5	
	0.		8.1	
2 Daniels	7.5	2 Daniels	0.	Ascending polarization.
	5.4		0.	
	5.2		2.9	
	6.		3.6	
	6.2		0.	
	7.		7.	Descending polarization.
	7.		7.	

EXPERIMENT 202.

1 Daniel:			1 Daniel:		
Rheochord.....1739		3.9	Rheochord.....5	11.	Rana temporaria. A descending irritating and an ascending polarizing current.
		10.	18	18.5	
		10.	56	22.4	
	1009	8.		10.	
		8.	8	11.	
		9.	4	9.5	
	1580	0.	4	8.2	
	1739	4.8	4	12.1	
	1059	5.		9.8	
		8.		9.8	
		9.1		12.3	
		7.4		12.3	
	1009	11.1	5	17.6	
2 Daniels		6.5	1 Daniel	9.2	
		6.5		9.2	
		2.2		6.7	
		6.8		13.	
		5.9		13.	
		5.9	2 Daniels	11.8	
		5.7		10.9	

EXPERIMENT 202—Continued.

Irritation alone.		Irritation with polarization.		Remarks.
Strength of the irritation.	Height of the contractions.	Strength of the constant current.	Height of the contractions.	
cent.	*mm.*	*cent.*	*mm.*	
	10.7	3 Daniels	4.	
	8.8		4.1	
	9.2		4.1	
	11.		4.1	
	9.5		4.1	
	9.8		0.	
	4.		11.	Descending polarization.
	3.4		10.5	
	3.7		10.8	
	3.5		10.8	

EXPERIMENT 203.

1 Daniel: Rheochord.....1009	11.3	3 Daniels	0.	Rana temporaria. A descending irritating and a descending polarizing current.
	10.1		0.	
	10.3		0.	
488	10.4		0.	
	10.5		0.	
	10.6		9.3	
	9.		1.	Ascending polarization.
	9.5		0.	
	8.8		0.	
	4.5		8.	Descending polarization, muscle weighted 20 grammes.
	6.4		7.3	
	0.		8.2	
	0.		4.	
	6.5	2 Daniels	10.9	Weight removed.
	6.5		11.7	
	6.7		10.9	
	6.4		10.9	
1 Daniel	6.2	2 Daniels	0.	Ascending polarization.
	5.5		0.	
	6.1		0.	
	6.		0.	
2 Daniels Rheochord.....1009	4.9	1 Daniel	8.1	
	11.		13.5	
	11.2		12.5	
	11.3		12.8	
	9.8		14.9	
	12.5		19.3	
	4.5		3.1	Muscle weighted 20 grammes.
	3.		2.	
	3.		0.	
	2.5		0.	
	0.6		3.5	Weight removed.
	0.2		2.5	
3 Daniels	4.		10.8	
	9.2	18	19.7	Descending polarization.
	0.		8.5	
	0.		9.	Ascending polarization.
	0.		7.3	
	0.		7.6	

In this experiment, as in "Experiment 198," weighting the muscle greatly influenced the effect of polarization on the excitability of the nerve.

I could multiply these experiments almost indefinitely, having made upwards of 500 of them, but these few will suffice to justify the conclusions at which I have arrived. It is true that the experiments given are all made with the irritation applied peripherally from the polarization, but I have made numerous experiments where this relation was reversed which gave the same results. These may, however, be the subject of a future paper.

CONCLUSIONS.

The effect of an irritation of a polarized nerve as compared with the effect of the same irritation of the non-polarized nerve depends—

1. On the proportion between the strengths of the polarizing and irritating currents.

2. On the circumstance that the irritation is to the side of the anode or to the side of the kathode of the polarizing current.

3. On the length of time that the nerve muscle preparation has been exposed.

4. On the circumstance whether the muscle is weighted or not.

In at least two proportions of the two currents Pflüger's results can be obtained for an uncertain period of time. Another proportion reverses this effect, and gives increased excitability to the side of the anode, and a diminished excitability to the side of the kathode. Other proportions of the two currents may give an increased or a diminished excitability to the side of both poles. And, lastly, we may have the polarization failing absolutely to influence the effect of the irritation.

APPLICATION OF THE CONCLUSIONS.

The results obtained in the foregoing experiments would be of interest, even if they had but a scientific value, but their value is much enhanced by what they promise in enlightening our views on the pathology of the nervous system.

As respects diseases of the peripheral motor nerves, they open up an entirely new field of work. Every physician who has had even the least experience in electro-therapeutics must have come across cases of local motor affections of the nerves, producing a paralysis, which for a long time apparently resists all electrical treatment, when by changing the strength of the electrical current employed a cure is effected in a very short time.

Two such cases have come under my observation. In one of these the attending physican had used a constant current of very great strength, and only aggravated the existing paralysis of the arm and forearm. I advised and applied, daily, a constant current derived from but two large Daniel cells, and in less than a month the arm had almost completely recovered.

Another case occurred during my presence in Vienna. A young girl suffered from choreaic twitchings of the left hand. The application of constant currents of but slight strength to the brachial plexus increased these twitchings. When the current was increased in strength the twitchings ceased, and ultimately the patient was cured.

With the sensory nerves similar phenomena can be observed. A person strikes his head (or some other portion of his body) against a hard object, and as a result a sensation of pain remains. Now, applying a constant pressure to the injured part will increase, decrease, or even

abolish the pain according to the degree of pressure. Applying the constant pressure to other portions of the body will oftentimes relieve or increase the pain. Under these circumstances the constant current is replaced by the pressure.

The experiments are again of importance in explaining the varying symptoms following a hemorrhage into a given portion of the brain, and also in explaining why a lesion in the neighborhood of the corpus striatum in man should produce hemiplegia of the opposite limbs, while its destruction in man or any of the mammals is never followed by this symptom. Again, it will explain why we have sometimes paralysis and at other times convulsions, or in still other cases paralysis and convulsions in the same person from the same brain lesion.

The fact that cerebral-hemiplegia had never been produced in animals attracted my attention four years ago. Since that time I have constantly endeavored to produce this symptom in animals, but until recently with no success.

After having found that section of the whole brain immediately above the corpora quadrigemina is not followed by abolition of the voluntary movements,* it occurred to me that perhaps Brown-Sequard's theory was the true one, and that the paralysis resulting from brain lesions was due to the irritation and not to the destruction of the nerve tubules in this organ. If this be so, an irritating substance injected into the brain in the vicinity of the corpus striatum would produce paralysis of the opposite side of the body. I tried this by injecting aqua ammonia, but in the first experiments injected too much, and the animals died in convulsions or coma. Later, by using an injection of 1–3*m*, I was, in several dogs and cats, able to produce hemiplegia on the side opposite to that on which the injection was made. The animals, in attempting to walk, dragged their limbs as in true hemiplegia. Even in them, however, under unusual strong excitement, the paralyzed limbs were moved.† This result could not have been due to pressure on distant parts, as the injection of a similar quantity of water failed to produce the same effect.

These experiments with ammonia were sufficient to show that hemiplegia can be produced in animals by the injection of irritating substances in the neighborhood of the corpus striatum. The same effect

*A most interesting case is reported by Dr. Harlow (Boston Medical and Surgical Journal, December 13, 1848), in which the portions of the brain frequently considered as presiding over volitional movements were destroyed by a tamping-iron being driven through the skull. The patient lived many years after the injury was received. No signs of paralysis were manifest.

Another case is reported by Dr. Folsom (Pacific Medical and Surgical Journal, May, 1869), where a longitudinal hemi-section of the brain, extending nearly, if not quite, to the base of this organ, was made by the patient falling against a circular-saw revolving about two thousand times a minute. The man recovered without paralysis.

† Carpenter (Physiology, 1855, note on page 635) reports similar phenomena occuring in a man. Abercrombie (On the Brain), Wicke (Die Grossen Veits-Tanzele), and other authors report similar cases.

was produced when a solution of the glucoside saponin was substituted for the ammonia. With these substances hemiplegia was not always produced, though the injection was made into the same portion of the brain. In some cases a sort of hemi-chorea, and in others general convulsions, were produced.

From these experiments we must believe that hemiplegia results from an irritation (or polarization?) and not from the destruction of motor centres. How are these, the varying results following irritation of the same part of the brain, to be explained?

Ammonia or saponin applied to a nerve tubule* really acts by polarizing this structure. The impulse causing the animal to make volitional movements comes from the peripheral centres, and is no doubt similar to an irritation in its effects on the central nerve tubules. Now, it was seen that in a polarized nerve the effect of the irritating current is increased or decreased as the relation between the proportions of the two currents is changed. A polarizing current of a certain strength applied to the fibres in the vicinity of the corpus striatum will diminish or totally "inhibit" an ordinary volitional impulse;† but when we increase the strength of this irritation or impulse, as we undoubtedly do under strong excitement, other proportions between the two currents result, and consequently we have other effects.

Again, under other circumstances a lesion of the same portion of the brain will produce convulsions. Here we have the proportions between the strengths of the two currents again changed. The polarizing current now increases instead of decreases the effect of the irritating current.

In conclusion, I would say that the reason why a lesion in the same portion of the brain at one time produces paralysis, at another has no effect, and in a third instance produces convulsions (or tremors), is to be found in the proportion, which exists in each individual case, between the current developed in the nerve tubule by the lesion and that which proceeds from the peripheral centres in the production of volitional impulses.

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*A nerve tubule undoubtedly has the same properties whether it be of intercentral or peripheral significance.

†A hemiplegic person has the will to move the paralysed limbs, but not the power.

RESEARCHES UPON FEVER.

By H. C. Wood, Jr., M. D., *of Philadelphia.*

The following is a brief analysis of the argument and results, so far as reached, of the researches upon fever, which have occupied my attention for some years, and towards which the Smithsonian Institution has so liberally contributed pecuniary aid. This article, however, affords nothing more than the barest outline of the work done; many minor points and discovered facts are altogether omitted, and no allusion is made to the work of other persons. The extended memoir awaiting publication by the Institution will contain all necessary historical matters and any proper acknowledgment of previous investigations. It may be allowable here to state that, except in the chemical section, showing the agreement between my results on heat production and studies on the same subject, made by calculating ingesta and egesta, no experimental results previously arrived at by other observers have been accepted without thorough repetition and verification.

The first effort, naturally, was to determine if fever be as complex as it seems, or whether there be not some dominant symptom which is the characteristic one of the process. By artificially heating living animals both throughout the whole body and in local regions, such as the head, it was clearly shown that elevation of the bodily temperature is sufficient to produce all the nervous and circulatory symptoms of fever, and that the cooling of the heated part is capable of removing the symptoms. Parallel experiments made upon man in simple thermic and other fevers gave parallel results to those reached in the lower animals, and warrant the conclusion that the dominant symptom of fever is the excessive bodily temperature. Fever may therefore be defined to be a morbid process which produces elevation of the bodily temperature. The question that naturally presents itself at this point is—Is the increase of the bodily temperature due to an increase of the amount of heat produced, or is it caused by a failure of the body to throw off its heat? As, however, the study of normal physiology naturally precedes that of morbid physiology, and as our knowledge of the methods in which nature regulates the production and evolution of bodily heat is very scanty, it seemed proper before proceeding farther with the researches upon fever to endeavor to elucidate the laws which govern the production or evolution of animal heat in health.

When the spinal cord of an animal is cut above the origin of the splanchnic nerves there is usually a great fall of the bodily temperature, which is in a measure proportionate to the temperature of the surrounding air. If the animal be placed in a heated apartment the fall of temperature is greatly lessened, and is sooner or later followed by a rise. In some animals the rise of temperature thus brought about is even greater than occurs in a normal animal placed in a similarly heated room. When the animal with a divided cord is in a cold room, death evidently is the result of the cold, the bodily temperature continually falling more and more until a point fatal to life is reached. The animal with a divided cord will live almost indefinitely in a room heated to 80°, but perishes in a very short time in a room of 40°. Another series of phenomena connected with spinal division is that where the cord is divided at its junction with the pons there is a very rapid rise of the bodily temperature, even in a cold room, to a point far above normal. It is plain that these phenomena may be either due to disturbances of heat evolution or of heat production, and that before any explanation of them can be satisfactorily given this point should be settled. This has been done by means of a calorimeter, whose general plan of construction resembles that of Senator. The principle of this is the heating of a given weight of water in a given time. This calorimeter measures only the amount of heat given off by the animal, or, in other words, heat evolution. If the animal gain in his bodily temperature during his stay in the calorimeter, it is plain that heat evolution is less than the heat production, and *vice versa.*

By taking the specific heat of the animal as the proportional mean of the specific heat of its constituents, namely as .75, we are able to calculate in heat units the amount of caloric lost or gained by the body, and to add to or subtract from the heat evolved as may be required to determine the amount of heat produced.

Employing this method it was found that immediately after section of the cord there is great increase of the heat evolution, if the calorimeter be at an ordinary temperature. On the other hand, when the hourly heat evolution was measured, some hours after the section, it was found to be much less than before the operation. The first increase of the heat evolution was always associated with a great fall of bodily temperature; and when the calculations were completed it was found that the extra heat imparted to the calorimeter during the first hour after the spinal section was not equal to the amount lost by the body, or, in other words, that immediately after the operation there was lessened heat production. In the subsequent hours of life, both heat production and evolution are markedly lessened. The result thus obtained may be stated as follows: Section of the cord at usual temperatures is followed by markedly lessened production of animal heat, continuing until death, and also by an immediate excessive loss of heat, which continues until

the surplus caloric of the body has been yielded up, and then becomes proportionate to the diminished heat production.

The cause of the primary increased heat evolution is probably vasomotor palsy. The interior of the body maintains its temperature by keeping a partially cooled layer between it and the external air. When the external cold is great, the superficial vessels are contracted, and loss of heat is as far as possible prevented. After section of the cord, the superficial capillaries relax and the surface temperature rises. Later on, as the interior heat fails, the superficies and the deep parts of the body alike grow cooler, and the great loss of heat is arrested. A question now presented itself for solution, as to how far the loss of heat directly checks chemical movements inside of the body, and how far the lessened heat production after cord section is the direct result of such influence of the cold. This was partially solved by placing the animal in a calorimeter heated to about 100° Fahr. Under these circumstances it was found that sometimes the heat production was maintained after the operation, but in other cases was markedly diminished: the causes of the difference will be fully detailed in the extended memoir, but are here omitted. The calorimeter worked at a high temperature is not an instrument of precision, so that no absolute authority can be accorded to the experiments just spoken of. Nevertheless it will be seen that the results accord with the fact (earlier stated) that sometimes in the heated chamber rise of the bodily temperature was more pronounced after than before section of the cord. The evidence indicates that after spinal section the diminished heat production is not always or even usually in chief part caused by loss of heat, but that the reduction of temperature may have some influence in lessening the activity of the chemical movements of the body.

When the great rise of bodily temperature that follows immediately section of the cord above the governing vasomotor center in the medulla is called to mind, the necessity of studying as to whether this rise is due to disturbance of heat evolution or heat production becomes apparent. Such studies reached the result that heat production is excessively increased by section of the cord at its junction with the pons.

An elaborate series of experiments were performed confirming the results previously reached by other observers, that if changes in the arterial pressure can be taken as a guide, the governing vasomotor center is situated in the medulla oblongata. Conceding this, it would seem proven that vasomotor paralysis is the cause of the diminished heat production which usually follows section of the dorsal spinal cord, even when the bodily temperature is artificially maintained. It is plain how such palsy must everywhere render the circulation much less quick, more sluggish than normal, and this is probably the immediate cause of the failure of heat productions. The fact that sometimes, especially in very vigorous dogs, the production of heat was rather increased than lessened by spinal section, indicates that there is some influence at work antagonistic to

the changes of the circulation, which is at times able to overcome the influence of these changes. This would seem to be rendered certain by the effects of section above the medulla, which was found to increase extraordinarily the production of the animal heat, the evolution not being notably affected. In one or more of the experiments the animal lived for twenty-four hours, and at the end of that time, notwithstanding no food had been ingested, the rate of heat production was still notably above normal. Where a result of nerve section remains for twenty-four hours it is usually considered paralytic, and it seems to me only the strongest arguments could establish that the increase of heat production just mentioned is of other character. Three theories suggest themselves as capable of accounting for the phenomena: first, that there is in the pons or higher up a center which inhibits chemical movements in the body, and that the section of the cord at the pons takes off from the general tissues this restraining influence; second, that the animal heat is mainly made in the muscle, and that the vasomotor center of the muscles is situated above the medulla, so that it is paralyzed when the section is made between the pons and medulla; third, that the section irritates the vasomotor centers and thus influences heat production by influencing the circulation.

The irritation theory was disproved by direct experiment, careful cardiometrical studies showing that the arterial pressure is not seriously affected by the operation, and that the circulation after the operation preserved all its normal relations with the organism below the section. Again, the persistence of the increased heat production for twenty-four hours seems very inconsistent with the irritation theory. Any one who has divided a spinal cord knows that all symptoms of irritation subside usually in a few minutes after a clean section. Finally, in two experiments punctures were made into the region of the junction of the medulla and pons, just sufficient to cause irritation, and the result was lessening of the heat production.

The conclusion that there is among the upper nerve-centers one which directly or indirectly controls the production of animal heat independently of the vasomotor centers of the medulla was further corroborated by a series of experiments of a different character from any as yet spoken of. If a sensitive nerve be galvanized there is a fall of the bodily temperature, which has usually been attributed to changes in the circulation and respiration. By experiments, which will be reported fully in the memoir, this fall of temperature is shown to be independent of the respiration, or of any changes in the blood pressure, such as is produced through the governing vasomotor centers of the medulla. Further, when the pons is separated from the medulla by section, it is impossible to produce a decided fall of the bodily temperature by galvanization of a sensitive nerve, although both circulation and respiration are apparently affected as in the normal animal. The only plausible explanation of this is that there is a nerve center above the point of section, which

influences the development of animal heat independently of the respiratory or circulatory centers in the pons. It would seem, therefore, that we must adopt one of the first two theories as the true explanation of the phenomena observed. To decide which of the two is correct is not at present possible. We would naturally expect some distinct alteration of blood pressure to follow paralysis of the arterioles of the muscles, but the abdominal vessels are so enormous that it is possible that they are the dominating influence in the blood pressure. I am still engaged upon this subject, but what will come out of it is uncertain.

It having been noticed by Hitzig and other experimenters that wounds of certain portions of the brain cortex near the sulcus cruciatus are in the day followed by rise of temperature upon the opposite side of the body, attention was directed to this region. It was first proven by cardiometrical experiment that such wounds do not affect the general circulation to an appreciable extent. Seventeen calorimetrical experiments were there made. Five with destruction of both Hitzig's regions; result, average increase of heat production 53 per cent. Seven with destruction of one Hitzig region; result, average gain of heat production 19 per cent. Five with destruction of other portions of the cortex; result, in no case increase of the heat production. Then the same region was irritated with salt, and the heat production was found to be lessened. These results certainly are very extraordinary if there be no connection between this cortical region and the production of animal heat. Supposing the method of investigation faulty, the chances of nineteen successive experiments of different character, all concurring in their result, would be very small. When it is also borne in mind that these nineteen experiments are in accord with a long preceding series of complicated experiments, and that no exception has been met with, it is plain how small must be the chances of serious error either in the method or result.

In studying the subject of fever itself, the first question investigated was whether the febrile elevation of temperature be due to increased production, or simply lessened evolution of caloric. The experiments were mostly made upon dogs; each experiment lasted not less than three days, most of them six days; thermometrical readings being made every 20 minutes by night as by day. The normal and febrile states were studied, both when food was administered and when it was withheld. The first result was to show that there are two distinct varieties, so to speak, of animal heat, namely, that derived from the stored-up materials of the body, and that derived from the food; and that the second factor in the heat production is of great value, although it does not decidedly affect the bodily temperature. After a full meal, the amount of heat developed is enormous; but it is evolved as fast as produced. In fever little or no food is taken, and consequently this factor disappears. The heat produced at the expense of the stored materials of the body is always excessively increased in fever, and usually more

than compensates for the loss of the food heat. In the dog at least, however, there are periods of high temperature in which less heat is being produced than after a full meal in the normal animal. It is plain that disturbance of the heat production is a factor of the febrile state; but it would seem that there is also a disturbance of the heat evolution, else more of the extra caloric would be gotten rid of. It has been shown that the diurnal rhythmic changes of temperature are usually parallel in health and fever; and it would seem that in regular fever there is a moving up of the habitual plane of heat upon which the organism is run. What has been made out as to the methods of heat production and evolution naturally suggests, as a plausible theory of fever, that the febrile state is chiefly due to a loss of power of the upper centers, musculo-vasomotor, or heat inhibiting, as the case may be, and to a less extent of sensibility of the vasomotor centers which preside over heat evolution. As the result of the weakening of the upper centers, more heat is developed; whilst the benumbed vasomotor centers require a greater degree of heat to stimulate them to throw off the excessive caloric produced. In investigating the truth of this theory, the first effort was to determine how fever is caused. Many fevers are evidently the result of the introduction of a poison in the blood; but it has been thought that inflammatory fever is produced by irritation of peripheral nerve. If, however, all the nerves going to the hind leg of a dog be divided, and after recovery has taken place the anæsthetic limb be wounded, traumatic fever is developed as soon and as intensely as in the normal animal similarly wounded. Such fever would seem to be due to an absorption of a poison into the blood; for fever is a general pathological process, involving the whole system, and the blood in the wounded animal, with divided nerves, is the one apparent channel of communication between the injured part and the general system. It is plain that a poison circulating in the blood may affect heat production, either by acting upon the nerve centers or by acting on the tissues of the body. There are certain clinical malarial phenomena which tell very strongly against the idea of fever being due to an action upon the universal protoplasm. Such phenomena are the regular sequence of complicated symptoms which usually make up the intermittent paroxysm; the frequent regular interchange between this fever paroxysm and neuralgic and other nerve storms, one replacing the other; the occasional occurrence of local paroxysms of intermittent fever involving only or chiefly certain regions of the body. To aid in elucidating the matter, two series of experiments were performed: In the first, the effect of section of the cord was studied in animals suffering from fever. The result was an exaggeration of the phenomena which occur after spinal section in the uninjured animal, heat evolution being enormously increased at first. This indicates that in fever the vasomotor nerves are more active in restraining heat evolution than in health. The second series of experiments consisted in irritating peripheral sensitive nerves

in rabbits, upon successive non-fever days, and successive pyæmic febrile days. These experiments were made, and in each case, the same irritation being employed, the fall of temperature was much less upon the febrile than upon the non-febrile days. This, of course, indicates that in fever the inhibitory heat center is less powerful or active than in health.

In conclusion, the results reached in the research may be summed up as follows:

First. Fever is a morbid nutritive process, whose characteristic is excessive heat production.

Second. Heat evolution is under the control of the vasomotor nerve centers (the dominating center being situated in the floor of the fourth ventricle, near the point of the calamus); including also in man the nerves which preside over the secretion of sweat.

Third. Heat production is dominated by some higher nerve centers of uncertain nature.

Fourth. That in health there is in man, and probably in every animal, a fixed temperature mean, and a normal diurnal variation of temperature having a regular rhythm, which is beyond the control of all disturbing causes that do not force the organism beyond the limits of health.

Fifth. That the maintenance of the normal variation is the result of the play between the nervous systems which control the functions of heat production and evolution.

Sixth. Fever is a morbid process in which there is not only an elevation of the bodily temperature but also an increase in the chemical movements of the stored materials, *i. e.*, the tissues of the body; this increase being usually but not always much more than sufficient to compensate for the loss of food heat. The rise of the bodily temperature in fever is not solely dependent upon increased heat production.

Seventh. In fever there is usually a daily temperature variation parallel to and differing from the normal health variation only in having a higher mean.

Eighth. That vasomotor paralysis in fever is followed by an almost instantaneous sinking of temperature below normal, the fall being much more rapid and excessive than is produced by vasomotor paralysis in health.

Ninth. The higher centers which preside over the heat function are not paralyzed in pyæmic fever in the rabbit, but are certainly less capable than in health of responding promptly and powerfully to stimulation; or in other words they are in a condition of paresis.

Tenth. That the clinical phenomena of malarial and other fevers indicate that the febrile motion is of nervous origin.

Eleventh. That in most and probably in all continued fevers the symptoms are due to a poison in the blood.

Twelfth. That fever appears to be caused by a loss of functional activity in the higher centers which regulate the production and evolution of animal heat due to the action of a blood poison upon the centers.

UNIVERSITY OF PENNSYLVANIA,
Philadelphia, February 6, 1879.

CONSTANTS OF NATURE.

By John Le Conte,

Of the University of California.

[*Vide.* Paper on "Sound" in "Lond., Edin., Dub., Phil., Mag." 4th Series, Vol. 27, pp. 15, 16, 17, 18, 29 *et seq.*—January, 1864.]

	Constants.	Logarithms.
Weight of 1 litre of mercury at Paris, 60 metres above sea, at 0° C	13595.93 grammes	4. 13340,89199
Weight of 1 cubic foot (English) of same	848.7196416 pounds avoirdupois	2. 92876,42591
Weight of 1 cubic inch (English) of same	0.4911572 pounds avoirdupois	−1. 69122,05210
Do	3438.1004 grains	3. 53631,85610
Weight of 1 litre of pure, dry air at Paris, 60 metres above sea, at 0° C., pressure =760 ^{mm} of mercury, at 0° C	1.2932227 grammes	0. 11167,33192
Weight of same at sea-level	1.2932388 grammes	0. 11167,87259
Weight of same at equator	1.2893600 grammes	0. 11037,41927
Weight of same at latitude 45°	1.2927818 grammes	0. 11152.52294
Weight of same with 0.0004 volumes of CO_2 at Paris, height =60^{m}	1.2934963 grammes	0. 11176,51908
Do., at Paris, height = 0^{m}	1.2935124 grammes	0. 11177,05964
Do., at equator, height = 0^{m}	1.2896328 grammes	0. 11046,60703
Do., at latitude 45°, height = 0^{m}	1.2930553 grammes	0. 11161,70987
Weight of 1 cubic foot (English) of pure, dry air at Paris, height = 60^{m}, at 0° C., pressure = 760 ^{mm} of mercury	0.0807288 pounds avoirdupois	−2. 90702,86584
Weight of 1 cubic foot of same	565.101792 grains	2. 75212,66984
Weight of 1 cubic inch of same	0.3270265 grains	−1. 51458,29603
Weight of 1 cubic foot with CO_2	0.0807459 pounds avoirdupois	−2. 90712,05300
Do	565.22137 grains	2. 75221,85700
Weight of 1 cubic inch with CO_2	0.3270957 grains	−1. 51467,48319

$$\text{Weight of 1 litre of air} = \frac{1.2893600}{1+0.00367\times t}\times\frac{b-0.378\times f}{760}\times\left(1-\frac{1.32\times h}{r}\right)\times\left(1+0.005307746\times\sin^2\text{lat.}\right)$$

$$\text{Weight of 1 litre of air} + CO_2 = \frac{1.2896328}{1+0.00367\times t}\times\frac{b-0.378\times f}{760}\times\left(1-\frac{1.32\times h}{r}\right)\times\left(1+0.005307746\times\sin^2\text{lat.}\right)$$

[Weight in grammes: t = C°; b = height of bar in ^{mm} of merc. at 0° C: f = tension of aq. vap. in ^{mm} of merc. at 0° C: h = height above sea-level: r = rad. of earth.]

$\frac{\text{Dens. merc.}}{\text{Dens. air}}$: t = 0° C: pr. = 0^{m}.76	At Paris,	height = 60^{m} = 10,513.2163	4. 02173,56007
Do	At Paris,	height = 0^{m} = 10,513.085	4. 02173,01940
Do	At equator,	height = 0^{m} = 10,544.712	4. 02303,47272
Do	At latitude 45°,	height = 0^{m} = 10,516.802	4. 02188,36905
Same + CO_2	At Paris,	height = 60^{m} = 10,510.992	4. 02164,37291
Do	At Paris,	height = 0^{m} = 10,510.861	4. 02163,83235
Do	At equator,	height = 0^{m} = 10,542.481	4. 02294,28496
Do	At latitude 45°,	height = 0^{m} = 10,514.577	4. 02179,18212
Pressure of atmosphere at t = 0° C: bar = 0^{m}.76 of mercury	On square centim. = 1033.29068 grammes		3. 01422,25122
Do	On square centim. = 1.03329068 kilogrammes		0. 01422,25122
Do	On square metre = 10332.9068 kilogrammes		4. 01422.25122
Do	On square inch = 14.6963 pounds avoirdupois		1. 16720,82426
Do	On square foot = 2116.268 pounds avoirdupois		3. 32557,07347
Height of homogeneous atmosphere of air, at t = 0° C	= 7990.044388 metres		3. 90254,91930
Do	= 26214.52864 (English) feet		4. 41854,20762

	Constants.		Logarithms.
Length of seconds' Pend. Biot's results corrected	At Paris,	height = 60m = 0m.99390,2053	−1. 99734,35877
Do	At Paris,	height = 0m = 0m.99391,4420	−1. 99734,89915
Do	At equator,	height = 0m = 0m.99093,3412	−1. 99604,44721
Do	At latitude 45°,	height = 0m = 0m.99356,3224	−1. 99719.55080
Do	At pole,	height = 0m = 0m.99619,3035	−1. 99834,35010
Do	At London,	height = 0m = 0m.99418,3474	−1. 99746,65397
Do	At London,	height = 0m = 3ft.26181,573	0. 51345,94229
Do	At London,	height = 0m = 39in.14178,878	1.59264,06690

The value for London has been computed from Sabine's experiments. (Phil. Trans. for 1828), corrected by Baily (Mem. of Ast. Society, vol. 7).

$$\text{L in metres} = 0^{m}.990933412\left(1-\frac{1.32\times h}{r}\right)\times\left(1+0.005307746\times\sin^{2}\text{lat.}\right)$$

Velocity generated by gravity (g) in a mean solar second of time	At Paris,	height = 60m = 9m.80942,005	0. 99164,33331
Do	At Paris,	height = 0m = 9m.80954,210	0. 99164,87369
Do	At latitude 0°,	height = 0m = 9m.78012,073	0. 99034,42175
Do	At latitude 45°,	height = 0m = 9m.80607,593	0. 99149,52534
Do	At latitude 90°,	height = 0m = 9m.83203,113	0. 99264,32454
Do	At London,	height = 0m = 9m.81219,755	0. 99176,62851
Do	At London,	height = 0m = 32ft.19283,06	1. 50775,91683

$$g\text{ in metres} = 9^{m}.78012073\left(1-\frac{1.32\times h}{r}\right)\times\left(1+0.005307746\times\sin^{2}\text{lat.}\right)$$

Theoretical velocity of sound (Newton's formula) in dry air, at t = 0° C	279.9602 metres per second	2. 44709,62631
Do	918.5210 feet per second	2. 96308,91463
Experimental velocity of sound in dry air, at t = 0° C: Dutch experiments corrected, by Le Conte.	332.7167 metres per second	2. 52207.47
Do	1091.610 feet per second	3. 03806,76
By Van der Kolk	332.6724 metres per second	2. 52201,67
Do	1091.464 feet per second	3. 03800,96
Density of gas; air = 1. Regnault's results *corrected:*		
Oxygen	1.105612	0. 04360,27
Nitrogen	0.971346	−1. 98737,39
Hydrogen	0.069269	−2. 84053,89
CO_2	1.529100	0. 18443,59

LIST OF APPARATUS RELATING TO HEAT, LIGHT, ELECTRICITY, MAGNETISM, AND SOUND, AVAILABLE FOR SCIENTIFIC RESEARCHES INVOLVING ACCURATE MEASUREMENTS.*

Professors WOLCOTT GIBBS, EDWARD C. PICKERING, and JOHN TROWBRIDGE, of Harvard University, have lately corresponded with the leading institutions of learning, and obtained consent for the use of the below-mentioned instruments for purposes of research by properly-qualified persons.

UNITED STATES COAST AND GEODETIC SURVEY OFFICE, WASHINGTON, D. C.

The use of this apparatus may be had at the office, under appropriate regulations. Applications must be made to Capt. C. P. PATTERSON, Superintendent United States Coast Survey.

1. *Comparators of length :*

a. Saxton's pyrometer, or mirror comparator, for end measures.

b. Repsold's contact-lever comparator, for end measures.

c. Saxton's tracing and comparing machine, for line measures.

d. Hilgard's comparator, for line and end measures for any length between three and forty inches.

e. Rutherfurd's micrometer, with two screws at right angles, and circle of position for measuring stellar and solar photographs.

2. *Standards of length :*

a. Standard iron meter of original committee for establishing metric system (end measure).

b. Standard British yard (line measure).

Standard British yard (end measure).

Eighty-four-inch scale, divided to tenths of inches, made by Troughton and compared throughout by Hassler.

c. Decimetre divided into centimetres and millimetres, compared with the original standard metre.

d. Copy of toise, accurately compared.

3. *Apparatus for weighing.*—Balances of precision for maximum charges of 100, 10, and 1 kilogrammes, and 100 and 1 grammes.

4. *Standard weights.*—Standard troy and avoirdupois pounds; kilogramme in platinum and in brass accurately compared.

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* From the Scientific American Supplement for August, 1879.

American Academy of Arts and Sciences, Boston, Mass.

Applications for use must be made to Prof. Joseph Lovering, chairman of the Rumford Committee, Cambridge, Mass.

1. *Meyerstein's spectrometer.*—Aperture of collimator and telescope, 3.3 centimetres; magnifying power of telescope 18 times; graduated circle reads by means of two micrometers to two seconds. Instrument intended to be used with a diagonal eye-piece for obtaining reflection at right angles to the reflecting surface. It is not well adapted for measuring indices of refraction, except by the special method for which the instrument was designed.

2. *Large hollow prism* of glass, with movable glass faces, held in their places by springs. Angle 60°.

3. *Prof. J. Trowbridge's electro-dynamometer.*—Instrument for measuring the strength of powerful electric currents such as are produced by dynamo-electric machines. Mean radius of fixed coils 153.3 millimetres. Instrument described in Proceedings of American Academy of Arts and Sciences, October 9, 1878.

4. Thomson's galvanometer, resistance 6 ohms.

5. *Micrometer-level,* constructed by Alvan Clark & Sons. Telescope, 45 centimetres focal length and 4 centimetres aperture, in Y's moved by vertical micrometer screw, reading to 0.3″ by estimation of tenths. Intended also for use with eye-piece micrometer. One division of level tube (0.15 cm.) = 8.7″. Transverse level and slow motion for rotating telescope in Y's. Horizontal finding circle graduated to degrees.

6. *Light micrometer-level.*—Telescope 21 centimetres focal length and 25 centimetres aperture, in Y's moved by vertical micrometer screw, reading to 1.4″ by estimation of tenths. One division of level tube (0.25 cm.) = 1.8″. Horizontal finding circle graduated to degrees.

7. *Microscope-tube* and accessories, specially designed for measuring spectrum photographs. Also a *standard plate* of 24ths of an inch; rulings on glass by Prof. William A. Rogers.

8. *A large double induction coil* of the form devised by Prof. John Trowbridge.

9. *Apparatus for the determination of the mechanical equivalent of heat.*—Devised by Prof. Henry A. Rowland, of Johns Hopkins University, and now in his charge.

Harvard University.—Rumford Cabinet, Cambridge, Mass.

(In charge of Professor Wolcott Gibbs.)

1. *A spectrometer* by Brunner Frères, of Paris. The instrument has a single-graduated circle 10 centimetres radius, reading by two verniers to 5 seconds of arc, and by a micrometer eye-piece to about 2 seconds. The telescope and collimator have 33 centimetres focal length, and 3.4 centimetres aperture. The micrometer is provided with cross and also

with parallel spider lines, and with a separate collimating eye-piece. The spectrometer stands upon a plate of metal which can be made to revolve, so that measurements by repetition are practicable. The instrument is in perfect adjustment, and has everything necessary for the determination of wave lengths and of indices of refraction. In connection with it the Rumford cabinet possesses:

2. Two gratings, Nos. 1 and 2, ruled on speculum metal by D. C. Chapman with Mr. Rutherfurd's engine. One of these, No. 1, has 8,648 lines to the inch and a ruled surface (4.3 cm. × 5.2 cm.). The other has 17,296 lines to the inch and the same ruled surface as No. 1. They may be adjusted to the spectrometer above described by plate-holders constructed by William Grunow, of New York, with all necessary requirements for the measurement of wave lengths.

3. A collimator, 1.6 metres focal length and 6.5 centimetres aperture, mounted upon a stand and specially adapted to the study of the extreme visible red and violet ends of the spectrum. Object-glass by Alvan Clark & Sons. A quartz lens of same focal length is to be added to this instrument from the workshop of Steeg & Reuter, in Homburg vor der Höhe, as well as a telescope with quartz objective and eye-piece for observing the ultra-violet spectrum.

4. *A porte-lumière*, by Duboscq. A Foucault's heliostat has been ordered, and may be expected in the course of the summer.

5. *Vierordt's apparatus* for measuring the intensity of light corresponding to any part of the visible spectrum. Telescope and collimator 25 centimetres focal length. Apertures, 2.8 centimetres and 2.1 centimetres. The instrument was made by Schmidt & Haensch, of Berlin, and is complete with prism and colored glasses.

6. *A direct-vision spectroscope*, with two sets of 9 prisms each. Set 1 contains 4 prisms of carbonic disulphide and 5 of crown glass. Set 2 consists of 4 prisms of flint and 5 of crown. The length of the instrument is 60 centimetres. It is provided with a scale telescope, and the observing telescope has the usual angular motion. This instrument is also by Schmidt & Haensch.

7. *An inductorium*, by Apps, of London, giving a 4-inch spark.

8. *Three thermometers*, by Baudin, of Paris, reading to .01 degree centigrade.

No. 1. Reading from 0.° to 12° centigrade.

No. 2. Reading from 12° to 23°.

No. 3. Reading from 23° to 35°.

In these instruments the weights of the bulbs, stems, and contained mercury are given.

9. *Edison's tasimeter*, made by Patrick & Carter, of Philadelphia, and adjusted by Mr. Edison. See *American Journal of Arts and Sciences*, 3d series, Vol. XVII, p. 52. A galvanometer suited to this instrument will be found in the cabinet in charge of Professor Trowbridge, together with the requisite batteries and Wheatstone's bridge.

In connection with these instruments the following, belonging to the Rumford professor, are also available:

1. *A large spectroscope* with telescope and collimator of 4.75 centimetres aperture and 5.5 centimetres focal length. Magnifying power from 8 to 60 times. Object-glasses by Fitz, of New York. Six hollow prisms of carbonic disulphide—glass faces 6×8 centimetres—arranged on Mr. Rutherfurd's plan, so that all the prisms are constantly in the position of minimum deviation. The stand, observing telescope, and prisms of this instrument may be used in connection with the long collimator belonging to the Rumford cabinet.

2. *A large hollow prism*, with angle of 30°—glass faces 6×8.5 centimetres—for Professor Gibbs's solution of phosphorus and sulphur in carbonic disulphide. See *American Journal of Science and Arts*, Vol. IV, p. 6, 2d series.

3. *Two flint-glass prisms*—faces 8.5×5 centimetres—which may be used singly or together. Angles of 60°.

4. *Professor Gibbs's double or compensating prism* for the study of absorption spectra. See *American Journal of Arts and Sciences*, Vol. IV, p. 8.

5. *Five gratings* ruled with Mr. Rutherfurd's engine:

No. 1. Ruled on speculum metal, 6,480 lines to the inch. Ruled surface 2.1×2.8 centimetres. Metal a little tarnished.

No. 2. Ruled on glass and silvered, 8,640 lines to the inch; 7,021 lines upon a ruled surface 2×2.7 centimetres. Covering-plate of glass cemented with Canada balsam.

No. 3. Ruled on glass for spectra by transmission, 6,480 lines to the inch. Ruled surface 1.7×2.7 centimetres.

No. 4. Ruled on glass for transmission of light, 12,960 lines to the inch. Ruled surface 1.3×2.7 centimetres.

No. 5. Ruled on glass and silvered; 13,321 lines on a space 19×24 centimetres, with covering-glass cemented by Canada balsam.

Kirchhoff's, Angström's, and Mascart's maps of the spectrum.

Mr. Rutherfurd's original photographs, together with the German lithographic reproduction of the same.

Mr. Rutherfurd's recent photographs taken with the diffraction spectrum. Thalen's map of the absorptive bands of iodine vapor.

The thermometers by Fastré, of Paris, carefully compared with an air thermometer reading from 0° to 100° C.

HARVARD UNIVERSITY.—DEPARTMENT OF PHYSICS.

(In charge of Professor JOHN TROWBRIDGE.)

1. *Edelmann's* instrument for measuring horizontal and vertical intensity of earth's magnetism.

The peculiarity of this instrument consists in its allowance of a long suspension, and in its torsion head.

2. *A standard ohm*, and two boxes of resistance coils running from one to five thousand ohms.

3. *An induction coil* made in the horseshoe form and provided with iron plates for armatures. The two induction coils comprise a resistance of 12,000 ohms.

4. *Galvanometer for absolute measure.*—Maker: Edelmann, Munich. A short coil minor instrument, adapted for absolute measures by certain methods. Resistance, 6 ohms.

5. *Thomson's reflecting galvanometers.*—One of 5,880 ohms resistance—a differential instrument.

One of 6 ohms resistance, adapted for heat measures.

6. *Thomson's quadrant electrometer.*—Made by White, of Glasgow.

7. *Cathetometer.*—Maker: Perreaux, Paris. Reads by vernier to 2-100ths of millimetre, or by micrometer to 1-100th of a millimetre. Focal length of objective, 13 centimetres; magnifying power of telescope 30 times.

8. *Dividing engine.*—Maker: Perreaux, Paris. Screw, 61 centimetres long. Pitch of screw, one-half of a millimetre. Micrometer reads to one four-hundredth of a millimetre. Instrument adapted only for graduating tubes and scales, or for comparison of graduations.

9. *Large spectroscope.*—Designed by Professor J. P. Cooke, of Harvard University. Two trains of prisms. One of nine bisulphide of carbon prisms of 45°. One of nine flint-glass prisms of 45°. Graduated circle reading to 10 seconds, also a micrometer eye-piece. Magnifying power of telescope, 10 times; focal length of objective, 46 centimetres; aperture, 5.5 centimetres.

10. *Reading telescope and scale.*—On brass leveling stand. Telescope provided with two objectives: one for short, the other for long, distances.

Magnifying power for long distances, 22 times.

Magnifying power for short distances, 30 times.

Focal length of the objective for long distances, 30 centimetres.

Focal length of the objective for short distances, 23 centimetres.

Aperture of objectives, four centimetres.

HARVARD UNIVERSITY.—ASTRONOMICAL OBSERVATORY.

(In charge of Professor E. C. PICKERING.)

LIST OF INSTRUMENTS NOT IN CONSTANT USE AND AVAILABLE FOR RESEARCH.

1. *East transit circle*, by Troughton and Simms, of London. Aperture of telescope, 4¼ inches; focal length, 5 feet. Described in Vol. I, pt. 1, of the Annals of the Observatory, p. 46.

2. *West equatorial*, by Alvan Clark & Sons, of Cambridge. Aperture of telescope, 5¼ inches; focal length, 7½ feet. Described in Vol. VIII of the Annals of the Observatory, p. 31.

3. *Portable transit instrument*, by Herbst, of Pulkowa. Aperture of telescope, $2\frac{3}{4}$ inches; focal length, 33 inches. Eye-piece at end of axis. Described in Vol. VIII of the Annals of the Observatory, p. 28.

4. *Bowditch comet-seeker*.—Aperture, 4 inches; focal length, 33 inches. Described in Vol. VIII of the Annals of the Observatory, p. 32.

5. *Telescope*, by Lerebours. Aperture, 3 inches; focal length, 50 inches.

6. *Telescope*, by Alvan Clark & Sons. Aperture, $3\frac{1}{8}$ inches; focal length, 39 inches. Object-glass slightly damaged.

7. *Variation transit*, by Troughton & Simms, of London. Aperture of telescope, $1\frac{3}{4}$ inches; focal length, 18 inches.

8. *Traveler's transit theodolite*, No. 3527, by L. P. Casella.

9. *Sextant*, by Spencer, Browning & Rust.

10. *Spectroscope*, by Troughton & Simms, of London, with two prisms, and Professor Winlock's apparatus for recording observations, as described in Vol. VIII of the Annals of the Observatory, p. 33.

11. *Spectroscope*, by J. Browning, of London, with one prism, and Professor Winlock's apparatus for recording observations.

12. *Spectroscope*, by Alvan Clark & Sons, of Cambridge, with five prisms and reflecting prism to send the light a second time through them. Dispersive power exceeding that of 22 ordinary prisms. Prisms not movable. Described in Vol. VIII of the Annals of the Observatory, p. 35.

13. *Lens of plate glass*.—Focal length, about 40 feet; aperture, 4 inches.

14. *Lens corrected for chemical rays*.—Focal length, 32 feet 5 inches; aperture, 4 inches.

15. *Photometer*, by Ausfeld, of Gotha, on plan of Professor Zöllner.

16. *Occultator* (for computation of occultations), on plan of Rev. Thomas Hill.

17. *Position circle*, read by verniers to minutes of arc.

18. *Thermometric chronometer*, by C. Frodsham, of London, No. 3,424, constructed so as to increase its daily rate by 6.11″ on a reduction of one degree Fahrenheit.

19. *Clock*, by W. Bond & Son, of Boston, No. 312.

20. *Small chronograph*, by Herbst, of Pulkowa.

21. *Portions of the magnetic apparatus* described in Vol. I, part 1, of the Annals of the Observatory.

(Property of Professor WILLIAM A. ROGERS.)

1. Small line and circle graduating engine. This machine is designed for all kinds of graduations, in which the length of the line to be ruled does not exceed 2 inches. The errors of the screw for one-thousandth of an inch have been carefully investigated. It is not automatic in its action, and hence it is not adapted to ruling diffraction gratings. The circular graduations are only approximate.

2. Machine for original graduation of circles from 1-inch to 15-inch disk.

3. Machine for shaping and polishing diamonds for marking on glass and on all kinds of metals.

4. Microscope comparator for short lengths.

5. Comparator for long standards of length.

6. In process of construction at the Waltham Watch Factory: A universal line graduation engine. This machine is designed:

(1). To rule Nobert's bands.

(2). To graduate both short and long standards of length.

(3). To rule diffraction gratings in which—

(*a*) Any required relation between the relative width of the lines and the spaces may be secured.

(*b*) Errors of any required magnitude may be introduced, whether individual or systematic, without interference with the remaining graduations.

HARVARD UNIVERSITY.—MEDICAL SCHOOL PHYSIOLOGICAL LABORATORY.

(In charge of Prof. H. P. BOWDITCH.)

1. *Thomson's galvanometer*, No. 26, Elliott Brothers. Resistance at 55° F. = 5,995 B. A. units.

2. *Wiedemann's galvanometer*, with mirror and two pairs of coils of 4,000 and 98 turns respectively.

3. *British Association unit of resistance*, No. 74, right at 15.5° C.

4. *Pendulum myograph*, described by Dr. J. J. Putnam at the American Academy, March, 1879.

5. *Cylinder chronograph:* Baltzar, Karolinen Strasse, 14, Leipsic.

6. *Chronograph*, with long roll of paper. Baltzar. Leipsic.

7. *Clock* for making or breaking an electrical circuit once in 1, 2, 3, 4, 5, 10, 15, 20, 30, or 60 seconds, the duration of the make or break variable from 0 to 4 seconds.

STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

(For the use of this apparatus application may be made to Prof. A. M. MAYER.)

1. *Apparatus for the determination of coefficients of expansion.*—Consists of the tube (invented by Professor Mayer) to hold the rod under measurement. This tube is so constructed that the rod up to its terminal planes is kept permanently at the temperature of melting ice, or at the boiling-point, or at any intermediate temperature, by passing a current of water or hot oil through the tube; at the same time the terminal planes of the rod are exposed for abutment against micrometer screws, &c. The rod is supported in the tube at quarters of its length from its

ends, and the weight of tube and inclosed rod is taken off the V's of the apparatus by straps and spring balances.

The measuring part of the apparatus is entirely distinct, and at a distance from the tube. The tube is only placed in contact with the measuring apparatus *at the moment* of making the measurement.

The measures are made by Saxton's reflecting comparator, or by micrometer screws brought up to the ends of the rod, and contact determined by the closing of a voltaic circuit.

Successive contacts, made by successively placing the rod (cooled to melting ice), give a range of measures on a rod one metre long, equal to about 1-30,000th of an inch. Micrometer screws, pitch 1-50th and 1-100th inch.

2. *Vertical comparator*, with contact lever, micrometer screw, pitch = 1-100th inch. Well made, heavy cast-iron frame of T section, mounted on a cast-iron tripod base.

3. *Apparatus for the comparison of yard and metre* (end or line measures) by Airy's method. Massive cast-iron plate with guides, two micrometer microscopes, with apparatus for handling measures.

4. *Spectrometer.*—Circle divided by Brunner of Paris, reading by vernier to 5″. Telescopes: one set, one inch aperture, 10-inch focus. Another set: collimator, 5 feet long, and observing telescope, 18 inches focus. (*Property of Professor Mayer.*)

5. *Interferential refractometer of Arago.*—Tube of one metre for holding gas whose index of refraction is to be measured. Collimator, six inches; observing telescope, three-quarters of a metre focus.

6. *Two of Hipp's chronoscopes.*

7. *Electric clock*, to be used in connection with inductorium and rotating cylinder, to determine the number of vibrations of tuning-forks and other solid bodies.

8. *Spherometer*, by Brunner, of Paris, furnished with a contact lever. Pitch of screw 0.5 millimeter.

9. *Full sets of resistance coils*, condensers, and high and low resistance Thomson galvanometers.

Massachusetts Institute of Technology.—Department of Physics, Boston, Mass.

(In charge of Professor Charles R. Cross.)

1. *Cathetometer*, by Staudinger. Scale graduated to millimetres; length, 1,020 millimetres. Vernier reads directly to 1-20th millimetre. Focal length of telescope is 280 millimetres. One division of level corresponds to 5″.

2. *Dividing engine*, by Buff and Berger. The microscope is carried by two screws moving at right angles to each other, so as to give two coordinates. The pitch is 1-20th inch, and the length of the screws, 16 inches and 4.5 inches respectively. Circles are divided into 100 parts,

read by estimation to tenths. The instrument is arranged especially for measurement rather than for graduation.

3. *Spectrometer*, by Clark. Furnished with five 60° and one 30° prisms, the latter silvered on its rear surface. A greater or less number of prisms can be used at will. Face of prisms 5.7 centimetres by 7.3 centimetres. Focal length of telescope, 70 centimetres; diameter of object-glass 5.2 centimetres. Diameter of circle, 43.5 centimetres, reading to 10″ by verniers. Smaller angles are measured by spider-line micrometer. The same telescope serves as collimator and observing telescope, the method of reflection from the silvered surface of the glass being used.

4. *Diffraction grating*, ruled by Chapman on Mr. Rutherfurd's engine. 17,256 lines to an inch; 30,600 spaces. Area of ruling, 4.5 centimetres square.

2. *Two prisms of quartz*, 60°, faces 5.5 centimetres by 4.0 centimetres. Also various prisms of flint glass and heavy glass.

Eaton's direct-vision prism of glass and carbon disulphide. Small direct-vision prisms of glass.

6. *Polarimeter* of Professor Pickering, for sky-polarization. See *Proc. Am. Acad.*, Vol. IX.

7. *Wheatstone's bridge*, by Elliott, measuring from .001 to 1,000,000 ohms.

8. *Thomson's long-coil galvanometer.*—Resistance, 3,000 ohms. Thomson's short-coil galvanometer for thermo-electrical work; resistance, 6-10 ohm.

9. *B. A. divided metre bridge.*

10. *Tangent galvanometer.*—36 coils, 26 centimetres radius. Gaugain tangent and sine galvanometer. Cosine galvanometer.

11. *Induction coil*, by Ritchie, giving 6-inch spark.

Columbia College, New York.

(In charge of Professor O. N. Rood.)

1. *Newman's standard barometer;* diameter of tube, 0.6 inch; reads to 1-500 inch.

2. *Grunow's spectrometer.*—Focal length of lenses, 14 inches; diameter of circle, 9 inches; aperture, 1.3 inches; reads to 10 seconds.

3. *Cathetometer.*—Length, 800^{mm}; focal length of telescope, 10 inches; aperture, 1.1 inches. Provided with extra object-glass for reading at short distances.

4. *Wild's photometer*, simple construction, diameter of circle, 6 inches.

5. *Apparatus* for measuring the velocity of sound in rods of wood by means of longitudinal vibrations. Described in *American Journal of Science*, Vol. XVII.

6. *Magneto-electric machine*, by Wallace (no motor).

7. *Ruhmkorff's diamagnetic apparatus.*

8. *Tangent compass.*—Diameter of circle, 13.5 inches.
9. *Original Siemens' unit.*
10. *Helmholtz apparatus for vocal sounds.*
11. *Koenig's phonautograph.*
12. *Koenig's cylinder* for determining the vibrations of tuning-forks.
13. *Nachet's large inverted microscope.*
14. *Koenig's monochord.*
15. *Lissajou's comparator.*
16. *Comparator* for the standard yard.

JOHNS HOPKINS UNIVERSITY.—PHYSICAL LABORATORY, BALTIMORE, MD.

(In charge of Professor HENRY A. ROWLAND.)

The list does not include apparatus for demonstration.

ACOUSTICS.

All the ordinary apparatus by Koenig, of Paris, including Helmholtz's double sirens, Lissajou's vibrating microscope, Hastings's pendulum comparator, &c.

OPTICS.

Meyerstein spectrometer—large model. The circle is of 16 centimetres radius, divided on silver to 6′ and reading by two microscopes to 2″. The probable and periodic errors of graduation have been investigated, and are given in the *American Journal of Science*, Vol. XV., p. 270. Having a common axis with the large circle is a table rotating independently, 6.5 centimetres radius, graduated on silver limb and by two verniers to single minutes. The massive stand has a joint by which the circle may be brought into a vertical plane. Aperture of telescope and collimator, 4.0 centimeters; focal length, 34 centimetres; powers, from 13 upward. A smaller telescope, 2.0 centimetres aperture, 18.0 centimetres focal length, power 7, may be placed on a third support rigidly connected with the microscope bearers. The accessories of this instrument are:

(*a.*) Two telescopes with Nicol prisms before objectives; longer diagonals of prisms, 2.0 centimetres; length of telescopes, 20.0 centimetres; power 3; position-angles of prisms read by circles of 3.5 centimeters radius to minutes of arc.

(*b.*) Babinet's compensator with wedge of 3 centimetres available length.

(*c.*) High power collimating ocular.

(*d.*) Low power collimating ocular.

(*e.*) Three micrometer eye-pieces.

2. *Spectrometer*, by Schmidt and Haensch. The circle has a silver limb 16 centimetres radius, divided to 6′ and read by microscopes to 2″.

Table in center has a graduation 6.0 centimetres radius, reading by verniers to 1′. Aperture of objectives of telescope and collimator, 3.9 centimetres; focal length, 35.0 centimetres; power, 13. The angle between lines of collimation of telescope and collimator may be read by small circle to single degrees.

3. *Steinheil's spectroscope.*—The clear aperture of train, including two 60° prisms, is 4.0 centimetres. Focal length of collimator and telescope, 32.5 centimetres; powers, 8, 12, &c. Photographic scale.

4. *Silbermann's heliostat, &c.*—This instrument, by Duboscq, has two mirrors 18.0 centimetres by 9.0 centimetres, one silver under glass and the other silver. Also, *porte-lumière.*

5. *Jamin's interferential refractometer*, with tubes 100 centimetres long, for the study of refraction in gases, and a glass trough 20 centimetres long for liquids, by Duboscq.

6. Complete apparatus for the study of phenomena of interference, by Duboscq.

7. *Photographic apparatus.*—Objective 6.1 centimetres aperture, and about 40 centimetres focal length for plates; 10×12 inches, by Steinheil. Dark room, collection of chemicals, and everything necessary for experiments on the subject.

8. *Becquerel's phosphoroscope*, by Duboscq.

9. *Polarizing apparatus*, from Steeg; also from Duboscq.

10. Apparatus for producing monochromatic light of any color. Designed by Hastings and made by Schneider.

11. *Prisms, gratings, &c.*

a. Hollow prism from Meyerstein; aperture, 6.1×5.2 centimetres.

b. Hollow prism from Steinheil; aperture, 2.2 centimetres.

c. Thallium glass prism from Steinheil; aperture, 4.8 centimetres.

d. Two flint glass prisms from Steinheil; aperture, 4.7 centimetres.

e. Crown glass prisms from Steinheil; aperture, 4.8 centimetres.

f. Two quartz prisms from Steeg; faces, 3.4×3.0 centimetres.

g. Iceland spar prism; faces, 2.6×2.2 centimetres, by Steeg.

h. Two rock-salt prisms, faces, 5.0×4.0 centimetres, by Steeg. Also rock-salt lens.

i. Large Nicol's prism, largest diagonal 6.5 centimetres. Also a number of smaller ones.

j. Gratings on speculum metal, 4.3×3.9 centimetres, with 8,648 lines to the inch, and 4.4×4.4 centimetres, with 17,396 lines to the inch, and a smaller glass grating, with 8,648 lines to the inch, all by Chapman with Rutherfurd's engine.

Kirchoff's, Angström's, and Rutherfurd's maps of the solar spectrum.

k. Old telescope by Dollond. Objective about 4 inches diameter and 6 feet focal length.

ELECTRICITY AND MAGNETISM.

The distinguishing feature of the apparatus for these subjects is its accuracy and the determination of the constants in absolute measure.

12. *Rowland's absolute electrometer* for potentials represented by sparks of about 0.1 to 1 inch. Designed on Sir William Thomson's guard-ring principle, and constructed by Edelmann, of Munich. Guard-ring, 33.5 centimetres, and can be separated about 7 centimetres, the distance being read by vernier to 0.01 centimetre. Movable disk, 10 centimetres diameter, and *firmly* attached to arm of a balance sensitive to 1 mgr. Balance moves only 0.01 centimetre, and means of two distances of the disks are taken, the one to move it to upper and the other to lower stop. Weights of from 1 to 5 grammes ordinarily used. *Disks ground and polished to mirror surface after nickel-plating.*

13. *Rowland's electrostatic standard condenser.*—Constructed by Grunow, of New York. One sphere within the other *nickel-plated and ground to mirror surface*, with extra ball for interior. Balls, 7 and 8 inches diameter. Hollow sphere, 10 inches diameter. Apparatus for centering. Radii determined by loss of weight in water. Can be charged and discharged any number of times at rate of three per second, by means of fine wires which pass in momentarily from outside, and so do not change the capacity much. Any condenser can be compared with it by means of an electrometer.

14. *Thomson's quadrant electrometer*, by White, of Glasgow, with Thomson's key.

15. *Condenser*, 1-3 microfarad, by Elliott.

16. *Commutators* for high (say 1 inch spark) as well as low tension.

17. *Rowland's galvanometer* for the absolute measurement of discharges of high tension. Constructed by Rowland & Schneider. Coils wound with paper between, and boiled in paraffine *in vacuo* at 100° C., to be thoroughly dry. Needle shielded from electrostatic action, and deflection read by mirror and scale. Number of coils about 11,000. Constant on the cm. gr. second system 19091.=G of Maxwell, as determined by comparison with galvanometer described in *American Journal of Science*, Vol. XV, p. 334. See No. 27, below.

18. *Rowland's absolute galvanometer* for the measure of quick, weak currents. Constant, 1833.2. See *American Journal of Science*, Vol. XV, p. 334. Constant very accurately known. 1,790 turns. Can be used as sine galvanometer or with mirror and scale. Horizontal circle reads to 1′, but is readily estimated to 30″. Telescope and bar for determining horizontal intensity in exact position of instrument.

19. *Rowland's tangent galvanometer*, brass circle, 50 centimetres diameter. Circle graduated to 15′ and 20 centimetres diameter. From 1 to 243 turns can be used, the constant of each set being known with great accuracy. Made by Meyerstein, but altered and wound and coils measured by Rowland.

20. *Two Thomson's galvanometers* of high and low resistance, the first differential with coils around both needles and set of shunts. Made by Elliott, of London.

21. *Two Nobili astatic galvanometers*, by Elliott, and one by Salleron.

22. *Wiedemann galvanometer*, with two sets of coils and two kinds of needles. Reading by mirror and scale.

23. *Galvanometer* with large wire for experiments on the damping effect of the coils on the needle, and for determining resistances in absolute measure. Designed by Rowland and made by Schneider, instrument maker at the university.

24. *Tangent galvanometer*, wooden circle, with a variety of coils of known constant.

25. *Mirror galvanometer.*

26. *Rowland's wooden circle*, 84 centimetres diameter, carefully laid up out of maple wood, and containing several grooves on the edge to contain single wires. It is used to surround a galvanometer, when, by aid of the electro-dynamometer, the horizontal intensity can be measured at any instant.

27. *Electro-dynamometer* of form given in Maxwell's Electricity, Vol. II, p. 330. Outer circles about 27.5 centimetres diameter, with 240 windings on each side. Constant, G, of outer coils 78.371 on cm. gm. second system. Inner coils about 5.5 centimetres diameter, with 63 coils in each. Moment of inertia of suspended coil accurately known. Constant calculated and also determined by comparison with a tangent galvanometer made of the circle described above. Made (partly) by Gurley, of Troy, and circles wound and measured by Rowland.

28. *Electro-dynamometer*, Quincke's form for weak currents. Made by Edelmann, of Munich.

29. *Standards of resistance*, mounted so that they can be placed in water 1 and 10 ohms, by Elliott; 10, 100, and 1,000 ohms, by Warden, Muirhead & Clark, of London; also mounted in another style—1, 10, and 100 Siemens, units, by Siemens & Halske, of Berlin. Also three copies of coil whose absolute resistance was determined by Rowland as 34.719 *earthquad.* ÷ sec.

30. *Resistance coils* in boxes, 1 to 10,000, and 10,000 to 100,000 ohms, by Elliott, and 1 to 10,000 Siemens' units by Edelmann.

31. *Rowland's resistance comparator.*—Ten coils, of 10 ohms each, arranged so that they can be joined in series or abreast, thus making 1, 10, and 100 ohms, besides intermediate ones. Made by Schneider and adjusted by Rowland.

32. *Two bridges* of Jenkins's form for the accurate comparison of equal resistances, and also a Wheatstone bridge, having wire of platinum-iridium alloy one metre long, by Elliott.

33. *Magneto-electric machine* for 1,200 candles, by Siemens Brothers, London, with engine to drive it, and both Siemens's and Foucault's lamps. Also a battery of 60 large bichromate cells.

34. *Ruhmkorff coil*, spark 15 or 20 centimetres, by Ruhmkorff, of Paris.

35. *Rowland's earth inductor*, with *brass* circle, 30 centimetres diameter, wound and measured by Rowland. Made by Meyerstein, of Göttingen.

36. *Ruhmkorff's apparatus* for diamagnetism. Made by Ruhmkorff, of Paris.

37. *Electric clocks* beating seconds from regulator.

38. *Rowland's standard of electro-magnetic induction.*—Three coils on brass cylinders which can be placed accurately on top of each other. See American Journal of Science. Mutual potential of coils with unit current 3,775,500; 2,561,974; 2,051,320, &c., on the cm. grm. second system.

39. *Telescopes, scales, and mirrors.*—Silvered brass millimetre scale by Brown & Sharp. Mounted telescope by Steinheil, objective 4.0 centimetres diameter, with three oculars, giving powers of 20, 40, and 80. Unmounted telescope by Steinheil, objective 2.7 centimetres diameter, and 3 oculars.

Mounted telescope and paper scale by Meyerstein; objective, 2.7 centimetres diameter.

40. Thin mirrors and plain parallel glasses by Steinheil. The mirrors give a *perfect image with the highest magnifying power.*

Thomson's replenisher on large scale for use with electrometer, Holtz and friction machines, Leyden jar batteries, Geissler tubes, &c.

HEAT.

41. *Rowland's instrument for comparing the mercurial with the air thermometer* between 0° and 100° C. Constructed by Schneider, instrument maker at the university. Readings seldom differ more than 0.02° or 0.03° C. at any one point, especially up to 40° C., and a change is contemplated which will much improve it.

42. *Rowland's instrument for comparing thermometers* from 0° to about 300° C. Constructed by Schneider. Accurate to about 0.1° C.

43. *Regnault's air thermometer*, Golaz, Paris.

44. *Jolly's air thermometer*, by Berberich, Phys. Inst. Univ. of Munich.

45. *Regnault's apparatus for expansion of gases*, both at constant pressure and constant volume, also Regnault's form of Rudberg's apparatus, Golaz, Paris.

46. *Regnault's apparatus for tension of vapors*, including: *a.* The boiler; *b.* The reservoir for compressed air; *c.* A rotary pump for compressing gases; *d.* Mercurial manometer. Maker, Golaz, Paris.

47. *Regnault's apparatus for specific heat* of solids, Golaz, Paris.

48. *Regnault's hygrometer with aspirator*, Golaz, Paris.

49. *Thermometers*, about 30 or 40, principally by Baudin, Paris, and Geissler, of Bonn. Many of these have been compared with the air thermometer as well as with standards by Fastré, Casella, or from Kew. The thermometers up to 40° C. undoubtedly represent the air thermometer more accurately than any so far constructed, and are supposed to agree with it to about 0.01° C. They have been compared with it eight times during about one year or more. The error in calorimetric investi-

gations from using uncompared thermometers *may* amount to two per cent.

50. *Rowland's apparatus for determining change of specific heat of liquids* with temperature. Constructed by Schneider.

51. *Dulong's apparatus for the heat of combustion*, Salleron, Paris.

52. *Melloni's apparatus* for radiant energy, Salleron, Paris.

53. *Two instruments for the calibration* of mercurial thermometers, one by Golaz and the other by Salleron.

54. *Rowland's apparatus for determining the mechanical equivalent of heat*, or for investigating the specific heat of liquids and their change with rise of temperature.

This instrument was constructed by the aid of funds contributed by the Rumford committee of the American Academy of Arts and Sciences, but the instrument will remain for the present at Baltimore. It was constructed by Schneider. It is run by a petroleum engine, No. 66 below.

To be constructed soon:*

Apparatus for compressing gases to 1,000 atmospheres.

Apparatus for *accurately* determining the form of the adiabatic curve of gases and vapors *at any temperature up to about* 100° C.

MISCELLANEOUS.

55. *Comparator*, by Meyerstein, for bars 1 metre long. Microscopes cannot be set nearer than 10 centimetres. One division of head of micrometer screws is about 1-700 millimetre.

56. *Microscope comparator*, designed by Rowland after Rogers's plan, and made by Grunow.

57. *Dividing engine*, by Perreaux. Free motion about 55 centimetres. Screw, $\frac{1}{2}$ millimetre thread. Head divided into 250 parts. 5.1 divisions of head gives 1 millimetre almost exactly. Subsidiary screw at right angles to other one.

58. *Air pumps.*—Rotary and common, by Ritchie, of Boston; mercury, on Jolly's plan, by Berberich, of Munich.

59. *Rotary pump* for compressing gases to 15 atmospheres. Golaz, Paris.

60. *Three mercury gauges*; one about 25 metres high, and measuring pressures up to about 33 atmospheres; one movable and measuring pressure from 1 to 4 atmospheres; and one measuring from 0 to 1 atmosphere.

61. *Barometer*, by James Green, of New York, with very large tube.

62. *Two cathetometers*; one by Meyerstein and the other by Salleron.

63. *Standard metres*, compared at Washington.

64. *Balances and weights.*—One balance weighing to 5 kilos. and accurate to about 1 mg., with weights from 5 kilos. to 1 mg. One weighing to 200 grms. accurate to about 0.1 mg., with weights from 100 grs. to 1

* Nos. 18, 24, 25, and 27, and the silvered scale of No. 39, belong to Professor Rowland, but are used in the laboratory.

mg. These are by Schickert, of Dresden. One heavy balance weighing to about 25 kilos. and accurate to about 0.1 grm., by Schneider.

Standard glass kilogramme on Jolly's plan, and compared with Berlin standard. From Berberich, in Munich.

The first balance mentioned is mounted on top of a case, so that globes for weighing gases can be suspended beneath it.

65. *Clock-work* with Foucault's regulator for running small apparatus at a regular velocity.

66. *Petroleum engine* of three-horse power. It is capable of giving a large amount of compressed air at more than 100 pounds to the square inch pressure, and might be used for repeating Thomson's and Joule's experiments or any others on the flow of gases.

67. *Two spherometers*; large by Meyerstein, and small by Salleron.

68. Several extra micrometer eye-pieces.

69. *Apparatus for researches on the flow of liquids.*—Greatest available head about 1.4 metres.

Biological Laboratory.

(In charge of Professor H. N. Martin.)

Apparatus for exact measurements.

1. *Pendulum myographion*, modified from Fisk's; available for the measurement and analysis of rapid movements. The instrument consists essentially of a pendulum carrying a glass plate at the bottom, swinging on friction rollers, and corrected for the latitude of Baltimore, so as to swing in one second. Behind the pendulum is a divided arc, and the amplitude of the swing can be varied from a few inches to four feet. In use an electro-magnet is moved along the divided circle, and then—the current being closed through it—the pendulum, on being raised, is held by it. On the other side is a catch, also movable along the arc. By turning a key at the side the current in the electro-magnet is broken, and the pendulum swings across and is held by the catch on the other side. During its transit the movement to be analyzed is inscribed on the glass plate, which is previously smoked. Designed by A. G. Dewsmith, esq., Trinity College, Cambridge, England. Made by Elliott, London.

2. A set of three pairs of König's recording tuning forks for measuring small periods of time; giving respectively 50, 100, and 200 double vibrations per second.

3. Bernstein's differential rheotome, with Helmholtz's electromotor to drive it. Zimmermann, Heidelberg.

4. Two Sir William Thomson's reflecting galvanometers; one large and the other small resistance. Elliott, London.

5. *Ludwig's kymographion;* to give uniform horizontal movement to an endless sheet of paper, on which vertical movements can be recorded and subsequently measured and analyzed. The instrument is provided

with an electro-magnetic chronograph. Made by Fulcher, Cambridge, England.

6. *Kymographion.*—Modification of the above. Made by Warden, Muirshead & Black, London.

7. "*Signal*" of Deprez. Electro-magnetic chronograph, recording up to 250 double vibrations per second.

8. *Chronograph* of Masey. Similar to above, recording to one-hundredth of a second.

9. *Spectroscope*, one prism, by Browning, London.

10. *Wild's Polaristrobometer.*—Schmidt & Haensch, Berlin.

11. *Completely fitted microscope*, by Zeiss, Jena. With microspectroscope and polarizing apparatus.

12. *Seconds clock with electric attachment.* Elliott, London.

CONDENSED LIST OF APPARATUS IN SMITHSONIAN INSTITUTION.

1 Shaw's testing machine.
1 Gaiffe's induction coil and battery.
1 Varley's resistance coil.
6 Ruhmkorff's galvanometers.
1 electrometer.
2 Holtz electrical machines.
3 Soleil's polariscopes.
1 Hall's spectroscope.
1 heliostat.
1 telescope, with rock salt objective.
14 radiometers.
1 phonautograph.
1 Koenig's chronograph.
2 electrical interrupters.
1 set Koenig's acoustical apparatus.
1 Hough's barograph.
1 Green's siphon barometer.
2 Casella's sensitive hygrometers.
1 magnesium lamp.
Miscellaneous optical, electrical, and meteorological apparatus.

ORNITHOLOGICAL EXPLORATION OF THE CARIBBEE ISLANDS.

By F. A. Ober.

The first week in December, 1876, I left New York in a small vessel for Martinique, situated in latitude 15° N. The usual passage is less than twenty days, but, owing to unskillful navigation, our vessel was stranded on the Bomunda reefs, and we were detained a month for repairs, not reaching Martinique until January 25, 1877. Learning that the island of Dominica, 30 miles to the northward, would be likely to give better results than Martinique, I sailed for that island in a small native sloop, landing at Roseau, the principal town, the 1st of February. Owing to unavoidable delays I did not reach any important collecting ground until the 1st of March, thus losing the first two months of the year in which fine weather generally prevails.

To properly understand the *fauna* of the Caribbean group, it should be borne in mind that, between the degrees of 12° and 18° north latitude, all the principal islands, except Antigua and Barbuda in the north, and Barbados away to the eastward, are volcanic, consisting mainly of high hills and mountains. The general resemblance strikes one forcibly as he sails along this chain of islands; each one like a huge rock thrown up from the ocean depths, terminating either in a single peak or split into a succession of mountain peaks and hills. In Dominica is the highest mountain south of Jamaica, in the West Indies, "Monte Diablotin," being above 5,000 feet in height. A slight sketch of the prevailing characteristics of the vegetation of this island will answer for all the volcanic islands.

There are, as it were, three zones or belts of vegetation, viz: that of the coast; that of the higher hills and lower mountains; that of the mountain tops. The first-named contains the plantations, upon which are found but few birds of any kind, owing to the absence of trees. The second contains all that is luxuriant in tropical vegetable life, and is especially peculiar in being the zone in which are first found the tree ferns and the forest of huge trees known as the "high woods." It may be roughly estimated as located between 500 and 2,500 feet above sea-level. Where an opening occurs for the sun to penetrate, animal life will be found more abundant than in the lower region. This I soon ascertained, and established myself in an opening in the forest where a sloping strip of land had been cleared of trees, about 1,500 feet above the Caribbean Sea, which it over-

looked at a distance of about five miles. This slope had been cleared by the ancestors of some half a dozen families of French colored people, and was planted fifty years ago with coffee trees; but now was overgrown with grass and wild trees. On all sides were high hills covered with the almost impenetrable forest. As the only collector who had visited this or any other island had not visited the mountains, but had merely examined the shore and the easily reached cultivated valleys, I knew my attention would be better directed to the wilderness, and that my only opportunity for rare or new birds would be among the half-civilized people of the mountains. The results have shown the correctness of my plans, and have been fully shown in the several catalogues prepared by Mr. Lawrence, from my notes and collections. In this region I obtained not less than five new species and two new varieties: The *Thryothorus rufescens*, *Dendræca plumbea*, *Myiarchus oberi*, *Vircosylvia calidris* var. *dominicana*; *Chaetura dominicana*, *Blacicus brunneicapillus*, and, later, in September, the *Strix flammea* var. *nigrescens*. As the more extended notes of my collections are already in manuscript for the catalogues and some already published, I will not refer to them here.

In April I returned to the coast, and, having left my specimens (200 in number) with a friend, to be sent to the States, started again for another part of the island, over the mountain ridges to the Atlantic coast, among the Caribs. It is a two days' journey, as I had to take it on foot, and several rapid swollen streams had to be crossed. All my baggage was carried upon the heads of my mountaineer friends, of whom I had four, three girls and a man. At the last house before reaching Indian country, five miles distant, I was hospitably entertained by the planter, who also secured me a comfortable hut from the natives.

As my space is here limited, I can do no more than rapidly sketch what would require many pages of description. Suffice it to say, that I found the Caribs of to-day different from the *Charaibs* of one hundred and fifty years ago, as described by Père Labat. They speak a French *patois* and are good Catholics, and through the influence of the French priests, who make them monthly visits, they have been compelled to intermarry with negroes to such an extent that the individuality of the Carib is gone. There are not more than twenty families of uncontaminated blood in the island. These, with a few in St. Vincent, comprise *the whole* of the remainder of the many thousands found in these islands by Columbus. A few old men and women only can speak the ancient Carib tongue; from these I obtained a good vocabulary, which, by comparing with another I secured in St. Vincent, I found to be correct. The Caribs are more peaceful citizens than the negro, more cleanly and intelligent, but not a whit more industrious or virtuous. They subsist by fishing and cultivating provision grounds in the mountains, but very few of them follow the chase. I remained with them six weeks, secured many valuable photographs, and many notes respecting them of value to the ethnologist and philologist. I was prostrated by fever upon my return to

Roseau, and passed the period of convalescence on the Caribbean coast, procuring, in my intervals of strength, the birds breeding in the cliffs. It was in the Atlantic Mountains that I procured the first specimens of the Imperial Parrot (*Chrysotis angusta*) ever sent to America.

The 4th day of July, 1877, I arrived at Antigua, in latitude 17° north, and examined that island, and also Barbuda, 30 miles farther north. These islands are of different formation from the others of the chain, though owing their origin, perhaps, to the same cause. The rocks of the western portion of the island, according to Davies, are of igneous character, denoting violent action and protrusion from beneath, akin to the volcanic, but without actual eruption or explosion. Eastern rocks belong to the "tertiary aqueous formation, being chiefly calcareous freestone and limestone, containing organic remains." "In the intermediate space are exhibited both igneous and aqueous action; the former in the indurated clays and siliceous cherts, forming the skirting western declivities; the latter in the numerous petrifactions, varieties of wood or coral, principally, if not entirely, siliceous." In Barbuda are many deer, wild guinea fowl, and horses, the result of stock introduced from England many years ago.

In Antigua I found one species of owl, since declared to be *new*, the *Speotyto amaura*, but few birds of any kind. In September large flocks of plover, and in October teal and duck, visit this island in large numbers. Its full *avi-fauna* will be found in the catalogue recently prepared by Mr. Lawrence from my notes.

In September, I sailed for St. Vincent, stopping two weeks, on my way south, at Dominica, to procure further specimens of the species declared new and rare by letter from Mr. Lawrence. I was there fortunate in securing the owl since identified as a local variety of *Strix flammea*, with three eggs. Two specimens were shot, male and female. Reaching St. Vincent in October, I early set to work, but was hindered by the rains. I not only searched all around the coast, but penetrated to the mountains. Here I was peculiarly fortunate, securing *seven new species*. The names, as appearing in the catalogue of the birds of St. Vincent, since published, are as follows: *Turdus nigrirostris*, *Myiadestes sibilans*, *Thryothorus musicus*, *Certhiola atrata*, *Certhiola saccharina*, *Leucopeza bishopi*, *Calliste versicolor*. My adventures in securing the *Myiadestes sibilans* were most interesting. I found that the only way to reach it was to camp upon the crest of the crater of the volcano, which I did, making my home in a cave for five days and nights, 3,000 feet above the sea. It rained continually during my stay, in my exposure to which I contracted a severe cold which culminated in a fever several weeks later. I had the exquisite pleasure, however, of securing there the wonderful bird named above, known to the natives as the "invisible souffriere bird." Barely a hint of the existence of this bird is contained in scientific annals, and that only in Goss's Birds of Jamaica, in a letter to the author of that work.

The Rev. Lansdowne Guilding, a clergyman residing in St. Vincent at that period, made many unsuccessful endeavors to procure it, and it was an object of search for fifty years. It was left for an American, however, to settle the doubt hovering over its identity, and to establish the fact that it is a separate species, and, what is of greater interest, a *new* one.

The proudest moment of my life, I think, was that in which I held the first specimen of that bird in my hand, after two days' search and the use of all my arts of allurement as taught me by my Carib friends. With the specimens of this genus, and the related genera of Dominica and Martinique, obtained by me, I feel assured that all doubts regarding their affinity may be set at rest. I secured six specimens of this bird, and at the same place and time the new species which they have done me the honor to name for my friend Nathaniel H. Bishop, the famous canoe voyageur. From the volcano I descended to the eastern slope, and passed three weeks with the Caribs there. Many photographs and much valuable matter relating to their traditions and language were obtained, but I could not secure such a series of their former implements of agriculture and warfare as I desired, owing to the same reason as in Dominica: the mountainous character of the island giving hiding-place to thousands of objects that in a flat country would be easily found, even after the lapse of centuries.

From the Carib country I returned to the west coast in a Carib canoe. In December, 1877, I again crossed the souffriere or volcano, and took up my line of investigation, to complete the circuit of the island. In this trip I procured two species of that rare and beautiful parrot, the *Chrysotis guildingi*.

In February, 1878, having recovered from my fever, I explored one of the northern grenadines, where I found in a cave an elegantly carved *tortoise* of wood. In this trip I also shot the first specimens of the black-bird, afterwards obtained in Grenada, pronounced *new*, the *Quiscalus luminosus*. These were lost through the wrecking of our boat. In St. Vincent I photographed and sketched two rocks which tradition affirmed were sacrificial rocks of the Caribs, containing incised figures upon them, fast being obliterated. A carefully drawn reproduction of this photograph will be forwarded with my detailed description. There is a larger rock of similar character in Guadaloupe.

I reached Grenada, the southernmost of the volcanic chain, in latitude 12° north, early in March, and at once proceeded to the interior of the mountains. There, in the high woods surrounding the famous mountain lake or "*grand etang*," I procured the wren, since named (*new*) *Thryothorus grenadensis*, and two other birds from the coast, *Quiscalus luminosus* and *Turdus caribæus*, three new species in all. Grenada is the only island containing the armadillo, and one of three only containing monkeys.

In the fauna of Grenada I was much disappointed; hoping to find many new and tropical species from Trinidad and the mainland of South

America, less than 100 miles away. Instead I found that there were fewer resident species than in the more northern (mountainous) islands, and but a hint afforded here and there of species I later found abundant in Tobago, and belonging to the continental fauna. This subject is spoken of more at length in my introduction to the Grenada catalogue. In April I sailed for Tobago, an island out of the route allotted me, but one containing valuable species, and the study of which, in connection with my previous observations in the Antilles proper, was imperatively necessary. In this island I brought to light many new facts regarding the early correspondence and discoveries of Mr. Kirk, the friend and collector of Sir W. Jardine, forty years ago.

Leaving Tobago I arrived in Barbados the last of June, and at once proceeded to Martinique, in which island I remained seven weeks. Martinique and Guadaloupe have both been well investigated, and I do not anticipate anything of value from these islands. Regarding the range of the "*Siffleur montagne*," or "mountain whistler," found also in Dominica, I consider my notes of value, and also relating to a few others. Here I encountered much trouble from the terrible serpent peculiar to that island and St. Lucia, the *Craspedocephalus lanceolatus*, two specimens of which, in rum, I sent to the museum.

In August I sailed for Guadaloupe, reaching the mountains the last week in that month. Here, though I do not expect there are any new birds among my collections, I procured some very rare ones, among which was the *Tappeur* or woodpecker—the only one found in the Caribbee Isles and not found in any other—the *Picus Vherminieri* of Lesson. Also the *Perdix croissant*, a dove peculiar to this island, the *Geotrygon mystacea*. Three of this species I brought home alive to Mr. Lawrence. Regarding the almost mythical *Diablotin*, the *Procellaria diabolica*? of L'herminier, I procured notes of interest. In Guadaloupe, as in Martinique, there is an excellent museum called the *Musée de L'herminier*. Nearly all the valuable collections of the late Dr. Lherminier were destroyed in the great fire that ravaged Point à Pitre a few years ago. Though the doctor discovered many new species here, some of the types of which he sent to France, and some of which (I think) are in the *de la Fresnaye* collection in Boston, none of his original notes are extant. I was told that they perished with his collections in the conflagration.

Leaving Guadaloupe in October, 1878, I arrived in New York, after a tempestuous passage, to find that of all the specimens shipped to the museum at different times, not one was lost. It will be seen that in ornithology alone my collections contained *eighteen species and varieties new to science*, a result that cannot fail to be considered gratifying. There yet remain (at this present writing, December) the collections from Martinique, Guadaloupe, and Tobago unexamined.

Fortunate as I have been, I cannot but regret that the appropriations for finishing my search and completing a work but little more than half accomplished were not forthcoming. All my private funds and all fur-

nished me by the Institution were exhausted when I was obliged to return. Another year to study the many problems, which require time for their solution, would, with the information now in my possession, add greatly to what has already been obtained, and give to our National Museum the first series of types, complete, of the *Birds of the Lesser Antilles.*

REPORT OF EXPLORATIONS IN GREENLAND.

By L. Kumlein.

The Florence sailed from New London harbor August 2, 1878. The general equipment was good, but some important items had been overlooked, which occasioned the scientific department much inconvenience.

The first harbor made was at Niantilic in Cumberland Gulf, after a passage of forty-one days. The prevailing winds were easterly and light, with much fog. Off Resolution Island a heavy northeast gale was encountered which stove one boat and did other damage. The ground was covered with snow on our arrival and it looked gloomy. The stay in Niantilic was short; having procured some Eskimo we set sail for the opposite shores of the gulf, and then for the North. Arrived in Annanatook harbor (the head of Cumberland Gulf) October 7, 1878. Arrangements were immediately made for an observatory, consisting of a canvas tent, around which a hut of snow was built. In this illy-lighted and poorly-warmed structure Mr. Sherman and myself spent our time till July.

During the winter we could procure *Pagomys fœtidus* at almost any time. This is by far the most common seal in Cumberland and the principal food of the Eskimo. *Phoca barbata* is only procured when there is open water, as they do not have breathing-holes in the ice. *Phoca cristata* was rare. *Callocephalus vitulinus* is often taken by the Eskimo in the salmon fjords. *Pagophilus grœnlandicus* common during open water. *Trichecus rosmarus* is common around Cape Mercy and on the opposite shores, but now not found at the head of the gulf, though their remains are common. Reindeer could be procured at any time a short distance from the coast inland, and even on the islands in winter. *Lepus glacialis* is quite common in some localities, but only two were obtained at our winter harbor. *Canus occidentalis* are met with in roving bands where the reindeer are the most common. *Vulpes lagopus* everywhere, but most plenty where there are numbers of hare and ptarmigan. *Ursus maritimus* is no rarity about Cape Mercy and the mouth of the gulf, but very rarely seen in the upper fjords. A single lemming was procured, and but two *Mustela*. Cetaceans of many species were common, especially so *Delphinapterus lucas* (of which a fine skeleton was procured), and their dreaded enemies *Orca gladiator*. An excellent series of skins, skeletons, and skulls of *Phoca fœtida* were secured; they range from a 6-inch fœtus to the adult of 5 feet. Studies were attempted on the diseases of the

Eskimo dog, and good points were ascertained. While dissecting one of these animals I had the misfortune to cut a finger slightly, and the virus (?) together with a frost-bite made me a cripple for two months, and came very near costing me the loss of my arm; this occurring in my busiest season, I lost many specimens. Eskimo women were instructed to skin and clean birds and mammals, which they soon learned to do very nicely, invariably removing the fat with the teeth. The greatest cold was in January—52°.5. From the 27th of February to March 18 the temperature did not rise above 35°. The heaviest snow-fall was in June. During the latter part of June the winds were southerly, driving the ice in a compact mass towards the head of the gulf so that it was nearly impossible to make any excursions away from the ship. No birds except *Corvus corax*, *Falco candicans*, and two species of *Lagopus* remain during the winter. The first birds to return are *Larus glaucus*, often long before there is any open water; they cruise up the ice-covered fjords and feed on the young of *Phoca fœtida*. As soon as the snow begins to melt *Plectrophanes nivalis* greets one with a very pretty song. Eiders, *Somateria mollissima*, nested by thousands on the rocky islets around our winter harbor, and the eggs were a very welcome addition to our rations. Some rare eggs were procured, among them *Tringa subarquata*, *Stercorarius pomatorhinus*, and *parasiticus Haliastus albicilla*.

Some Pacific species were added to the fauna of the Atlantic seaboard, and some birds of N. temperate North A. were found breeding to 68° 30′ N. Specimens were procured of *Pagophila eburnea*, *Buphagus skua Larus glaucescens*, and *leucopterus*, &c. The fauna seemed to be nearly identical with that of north Baffin's Bay. Only forty-two species of birds were met with in Cumberland Sound, and of these four at least were stragglers. Interesting notes were procured on rare or little-known Arctic waterbirds.

Some fossils were procured from Lake Kennedy and some interesting minerals. We left much too early to secure a fair representation of the flora of the district, poor as it is. The same species were collected on the Greenland coast in 70° 30′, much more luxuriant. The algæ could not be collected in the spring on account of the ice around the shores. They were abundant both in species and numbers, some of them remarkably large.

Some interesting notes on the habits, legends, &c., of the Eskimo were secured with drawings; also a good number of Eskimo drawings, which are very interesting.

Eskimo implements few, but still some very valuable forms were found. Great difficulty was experienced in getting the Eskimo to part with implements in use; even a considerable reward would not induce them to part with some things. The vicinity of Annanatook (our winter harbor) was a most remarkably barren place, bare granitic islands with steep bluff shores offering no place to collect marine life even at low tide. Notes of value were obtained on the distribution of mammals

and birds. Fishes were rare; we could only get two kinds in sufficient numbers to use as food—*Cottus scorpius* and *Salmo salar*. Other species were collected, but very few specimens. Did not get out of Cumberland Gulf till the 19th of July. We then took the pack-ice off Cape Mercy, and with strong east winds worked through 250 miles of it. Reached Godhavn Harbor on the last day of July. We had expected to meet the government expedition here, and had fifteen Eskimo, thirty dogs, clothing, and a vast amount of material requisite for a Polar expedition. We waited here till the 22d of August, and then set sail to return the Eskimo to their native place. During our stay in Godhavn we were greatly aided in our researches by Governor E. Fincker and Inspector K. Smitz, who did all in their power to make our stay pleasant, besides giving us much valuable information and many specimens. The ice in Baffin's Bay was the heaviest ever known to the Danish traders. No vessels, even the large Dundee steam-whalers, were able to get out of the Waigal Straits, nor could the Danes get to the Upernavik settlements. While returning to Cumberland we experienced a tremendous southeast gale which lasted nearly four days. When it abated we found our ship in the mouth of Exeter Sound, on the opposite shore of Davis' Straits, from where we had started.

During these four days we drifted at the mercy of the winds and waves among hundreds of icebergs, but received no damage to speak of. The Eskimo were landed and given some presents on the last of August. On the 12th of September we set sail for home, arriving at St. John's, Newfoundland, on the 26th, after a very stormy passage. On the 11th of October we sailed from St. John's. From this time till we reached Provincetown, Mass., we rode out six heavy gales of wind. The ship sprung a leak off Sable Island, and gave us much work and anxiety. Our provisions also became rather short, so we were put on allowance, and a very small allowance at that. I must not forget to mention that I used only a Remington breech-loading shot-gun, and that it did not fail me on a single occasion, though subjected to every kind of ill-treatment

RESEARCHES IN SOUND:

WITH SPECIAL REFERENCE TO FOG-SIGNALING.

By Joseph Henry.

[From the Annual Reports of the U. S. Light-House Board.]

PREFATORY NOTE.

[The series of investigations undertaken by the late Professor Henry in the interest of the light-house service, embracing not only observations more than usually laborious and extended, with regard to the atmospheric conditions affecting the propagation of sound to a distance, but varied and elaborate experimental inquiries, as well, with reference to the most efficient character and form of sonorous instruments for fog-signaling purposes, commenced as far back as the year 1865, and continued to the last year of his life.

These important investigations, though in the language of an official report, they "have resulted in giving us a fog-signal service conceded to be the best in the world,"* have hitherto received so little publicity and attention, owing to the purely official character and channel of their presentation, that their collection and republication here (in advance of of a possible edition of Henry's collected works), appears to be called for in the interests of science, as well as of a just appreciation of the value of his prolonged researches.

The first part, extracted from the Appendix to the Light-House Report for 1874, comprises a preliminary statement and an account of observations and experiments made by the author, from 1865, at New

*Executive Document No. 94, Forty-fifth Congress, second session, Senate, p. 2. This is a report to the Hon. Secretary of the Treasury, made since Professor Henry's death. To a similar effect, may be quoted an official statement made five years earlier. In 1873, Major George H. Elliot, of the Light-House Board, commissioned to make a tour of inspection of European light-house establishments, presented the results of his observations abroad in a very able and elaborate report, published by the Senate in 272 octavo pages, with numerous illustrations. In his preliminary report to the Board, dated September 17, 1873, he concludes, that while there are "many details of construction and administration which we can adopt with advantage," (from the British and French light-house systems,) "there are many in which we excel. Our shore fog-signals, particularly, are vastly superior, both in number and power." (Executive Document No. 54, Forty-third Congress, first session; Senate, p. 12.)

Haven, Conn., to 1872, at Portland, Me. The second part is a communication made to the "Philosophical Society of Washington" (of which he was the president) December 11, 1872, embracing a discussion of some abnormal phenomena of sound, and is extracted from the Bulletin of the Society, vol. ii, appendix ix. The third part, forming the latter portion of the Appendix to the Light-House Report for 1874, comprises investigations extending from 1873, at Whitehead Station, off the coast of Maine, to 1874, at Sandy Hook, New Jersey. The fourth part, extracted from the Appendix to the Light-House Report for 1875, comprises his investigations for that year. And the fifth part, from the Appendix to the Light-House Report of 1877, embraces his latest observations during September and October of the year 1877.

These papers necessarily are more fragmentary, and at the same time involve more recapitulation than would have been the case, could they have received the revision of their distinguished and lamented author. It has however been considered more just to reproduce these contributions in this form, than to attempt either a compilation of extracts, or a condensation of their substance in the form of an abstract.]

S. F. BAIRD.

RESEARCHES IN SOUND.

INTRODUCTION.*

Fog.

Among the impediments to navigation none perhaps are more to be dreaded than those which arise from fogs, and consequently the nature of this impediment and the means which may be devised for obviating it are objects of great interest to the mariner. Fogs are in all cases produced when cold air is mingled with warm air saturated with moisture. In this case the invisible vapor of the warmer air is condensed by the cold into minute particles of liquid water, which, by their immense number and multiplicity of reflecting surfaces, obstruct the rays of light in the same way that a piece of transparent glass when pounded becomes almost entirely opaque and is seen by reflection as a white mass. So greatly does a dense fog obstruct light, that the most intense artificial illumination, such as that produced by the combustion of magnesium, by the burning of oxygen and hydrogen in contact with lime, and that produced between the charcoal points of a powerful electrical apparatus, are entirely obscured at comparatively short distances. Even the light of the sun, which is far more intense than that of any artificial illumination, is so diminished by a single mile of dense fog that the luminary itself becomes invisible. Recourse must therefore be had to some other means than that of light to enable the mariner to recognize his position on approaching the coast when the land is obscured by fog.

The only means at present known for obviating the difficulty is that of employing powerful sounding instruments which may be heard at a sufficient distance through the fog to give timely warning of impending danger. Investigations therefore as to the nature of sound and its applications to fog-signals become an important object to those in charge of aids to navigation. Such investigations are of special importance in connection with the light-house service of the United States. The northeastern coast of the United States on the Atlantic, and the entire western coast on the Pacific, included in our territory, are subject, especially during the summer months, to dense fogs, which greatly impede navigation, as well as endanger life and property.

The origin of the fogs on our coast is readily explained by reference to a few simple principles of physical geography. In the Atlantic Ocean there exists a current of warm water proceeding from the Gulf of Mexico, between Cuba and Florida, which flows along our coast to the lati-

* From the Report of the Light-House Board, for 1874.

tude of about 35°, and then turning gradually to the eastward, crosses the Atlantic and impinges against the coast of Northern Europe. Throughout its entire course, on account of the immense capacity of water for heat, the temperature of the stream is greater than that of the ocean on either side. In addition to this stream, the Atlantic Ocean is traversed by another current of an entirely opposite character, one of cold water, which, coming from the arctic regions down Davis's Strait, is thrown, by the rotation of the earth, against our coast, passing between it and the Gulf-stream, and sinking under the latter as it approaches the southern extremity of the United States.

These conditions are those most favorable to the production of fogs, since whenever the warm air, surcharged with moisture, is blown from the Gulf-stream over the arctic current and mingles with the cold air of the latter, a precipitation of its vapor takes place in the form of fog. Hence, especially in summer, when the wind in the eastern part of the United States is in a southeasterly direction, fogs prevail. As we proceed southerly along the coast, the fog-producing winds take a more easterly direction.

A somewhat similar circulation in the Pacific Ocean produces fogs on the western coast of the United States. In this ocean a current of warm water, starting from the equatorial regions, passes along the shores of China and Japan, and, following the general trend of the coast, turns eastward and continues along our shore. The northern part of this current being warmer than the ocean through which it passes, tends to produce dense fogs in the region of the Aleutian Islands and the coast of Alaska. As this current descends along the American coast into lower latitudes it gradually loses its warmth, and soon assumes the character, in regard to the water through which it passes, of a comparatively colder stream; and to this cause we would attribute the prevalence of fogs on the coast of Oregon and California, which are most prevalent during the spring and early summer, with wind from the northwest and west.

From what has been said, it is evident that the fogs in the Aleutian Islands occur chiefly in summer, when southwesterly winds prevail and mingle the moist air from the warm current with the colder air of the more northerly latitude. In winter, the wind being from the north chiefly, the moist air is driven in an opposite direction, and dense fogs therefore at this season do not prevail.

In regard to the fogs on the coast of Maine, the following interesting facts were furnished me by the late Dr. Stimpson, formerly of the Smithsonian Institution and of the Chicago Academy of Sciences, who had much experience as to the weather during his dredging for marine specimens of natural history in the region of Grand Manan Island, at the entrance of the Bay of Fundy.

"So sharply marked," says Dr. Stimpson, "is the difference of temperature of the warm water from the Gulf-stream and that of the polar

current, that in sailing in some cases only a few lengths of a ship the temperature of the water will change from 70° to 50°. The fog frequently comes rolling in with the speed of a race-horse; in some cases while dredging, happening to turn my eyes to the south, a bank of fog has been seen approaching with such rapidity that there was scarcely time in which to take compass-bearing of some object on shore by which to steer, before I would be entirely shut in, perhaps for days together." He also mentions the fact that it frequently happened during a warm day, while a dense fog existed some distance from the shore, close in to the latter there would be a space entirely clear; this was probably due to the reflection and radiation of the heat from the land, which converted the watery particles into invisible vapor.

Dr. Stimpson has also noticed another phenomenon of some interest. "When a dense fog, coming in regularly from the sea, reaches the land, it gradually rises in the atmosphere and forms a heavy, dark cloud, which is frequently precipitated in rain." This rising of fog is not due, according to the doctor, to a surface-wind from the west pressing under it and buoying it upward, since the wind at the time is from the ocean. It is probably due to the greater heat of the land causing an upward current, which, when once started, by its inertia carries the cloud up to a region of lower temperature, and hence the precipitation. The height of the fog along the coast is not usually very great, and can be frequently overlooked from the mast-head. The deception as to size and distance of objects as seen in a fog is also a remarkable phenomenon when observed for the first time. A piece of floating wood at a little distance is magnified into a large object, and after much experience the doctor was not able to overcome the delusion. It is said that the sailors in the Bay of Fundy prefer of two evils a fog that remains constant in density to one that is variable, although the variation may be toward a greater degree of lightness, on account of the varying intensity producing a varied and erroneous impression of the size and distance of the object seen through it. It is also his impression that sound can be heard as well during fog as in clear weather, although there is a delusion even in this, since the source of sound, when seen, appears at a greater distance than in a clear atmosphere, and hence the sound itself would appear to be magnified.

Fogs also exist on the Mississippi, especially on the lower portion of the river. They are of two classes, those which result from the cooling of the earth, particularly during the summer in clear nights, with wind probably from a northerly direction, followed by a gentle, warm wind from the south surcharged with moisture, and the other induced by the water of the river, which, coming from melting snow of northern regions, is colder than the air in the vicinity. The air over the river being thus cooled below the temperature of a gentle wind from the south, the moisture of the latter is precipitated. This fog, which occurs in the last of winter, during the spring, and beginning of summer, is very dense,

but is confined entirely to the atmosphere above the river, while the other class of fog exists over the land as well.

Fog-Signals.

The importance of fog-signals as aids to navigation, especially on the northeastern portion of our coast, of which the shore is exceedingly bold and to the approach of which the sounding-line gives no sure indication, has been from the first an object of special attention.

At the beginning of the operations of the Light-House Board such instruments were employed for producing sound as had been used in other countries; these consisted of gongs, bells, guns, horns, &c. The bells were actuated by clock-machinery, which was wound up from time to time and struck at intervals of regular sequence by which their position might be identified. The machinery, however, by which these bells were struck was of a rude character and exceedingly wasteful of power, the weight continuing to descend during the whole period of operation, including the successive intervals of silence. This defect was remedied by the invention of Mr. Stevens, who introduced an escapement arrangement, similar to that of a clock, which is kept in motion by a small weight, a larger one being brought into operation only during the instant of striking.

Bell-buoys were also introduced at various points. These consisted of a bell supported on a water-tight vessel and rung by the oscillation of the waves, but all contrivances of this kind have been found to be untrustworthy; the sound which they emit is comparatively of feeble character, can be heard at but a small distance, and is frequently inefficient during a fog which occurs in calm weather. Besides this, automatic fog-signals are liable to be interfered with by ice in northern positions, and in all sections to derangement at times when no substitute can be put in their place, as can be in the cases of the bells rung by machinery under the immediate control of keepers. A signal which is liable to be interrupted in its warnings is worse than no signal, since its absence may give confidence of safety in the midst of danger, and thus prevent the necessary caution which would otherwise be employed.

Guns have been employed on the United States coast, first under the direction of General Bates, engineer of the twelfth district, at Point Bonita, San Francisco Bay, California. The gun at this station consisted of a 24-pounder, furnished by the War Department. The necessary arrangements being made, by the construction of a powder-house, and laying of a platform, and employment of a gunner, notice to mariners was given that after the 8th of August, 1856, a signal-gun would be fired every hour and half-hour, night and day, during foggy or thick weather. The first year, with the exception of eighty-eight foggy days, omitted for want of powder, 1,390 rounds were fired. These consumed 5,560 pounds of powder, at a cost of $1,487, pay of gunner and incidentals excluded. The following year the discharges were 1,582, or about

one-eleventh of the number of hours and half-hours of the whole time. The fog-gun was found to answer a useful purpose; vessels by the help of it alone having come into the harbor during a fog at night, as well as in the day, that otherwise could not possibly have entered. This signal was continued until it was superseded by a bell-boat. A gun was also used at West Quoddy Head, near the extreme eastern part of Maine. It consisted of a short piece, or carronade, 5 feet long, with a bore of $5\frac{1}{4}$ inches, charged with four pounds of blasting-powder. The powder was made up in cartridges and kept in chests in the work-house. The gun was only fired on foggy days, when the steamboat running between Boston and Saint John, New Brunswick, was approaching the light-house from the former place. In going in the other direction the signal was not so much required, because in the former case (of approach) the vessel had been for some time out of sight of land, and consequently its position could not be so well known. The firing was commenced with the hearing of the steamer's whistle as she was approaching, and as the wind during the fog at this place is generally from the south, the steamer could be heard five or six miles. The firing was continued as frequently as the gun could be loaded until the steamer answered by a signal of three puffs of its whistle. The number of discharges was from one to six, the latter exhausting a keg of powder valued at $8. The keeper of the light-house acted as gunner, without compensation other than his salary. The cost of powder was paid by the steamboat company. The report of the gun was heard from two to six miles.

This signal has been abandoned,—because of the danger attending its use,—the length of the intervals between the successive explosions,—and the brief duration of the sound, which renders it difficult to determine with accuracy its direction.

The lamented General Bache, of the Light-House Board, adopted a very ingenious plan for an automatic fog-signal, which consisted in taking advantage of a conical opening in the coast, generally designated a blow-hole. On the apex of this hole he erected a chimney which terminated in a tube surmounted by a locomotive-whistle. By this arrangement a loud sound was produced as often as a wave entered the mouth of the indentation. The penetrating power of the sound from this arrangement would not be great if it depended merely on the hydrostatic pressure of the wave, since this, under favorable circumstances, would not be more than that of a column of water 20 feet high, giving a pressure of about 10 pounds to the square inch. The effect however of the percussion might add considerably to this, though the latter would be confined in effect to a single instant. In regard to the practical result from this arrangement, which was continued in operation for several years, it was found not to obviate the necessity of producing sounds of greater power. It is however founded on an ingenious idea, and may be susceptible of application in other cases.

Experiments by Professor Alexander, in 1855.

The Light-House Board was not content with the employment alone of the fog-signals in ordinary use, but directed a series of experiments in order to improve this branch of its service. For this purpose the board employed Prof. J. H. Alexander, of Baltimore, who made a report on the subject, which was published among the documents. The investigations of Professor Alexander related especially to the use of the locomotive steam-whistle as a fog-signal, and in his report he details the results of a series of experiments in regard to the nature and adjustment of the whistle, the quantity of steam necessary to actuate it, with suggestions as to its general economy and management. He found, what has since been fully shown, that the power of the sound depends upon the pressure of the steam in the boiler, and the pitch upon the distance between the circular orifice through which the steam issues, and the edge of the bell. He appears however to be under an erroneous impression that the sound is produced by the vibrations of the metal of the goblet or bell, while in fact this latter portion of the apparatus is a resounding cavity, which, as I have shown in subsequent experiments, may be constructed of wood as well as of brass, in order to produce the same effect. Mr. Alexander also mentions the effect of the wind in diminishing the penetrating power of sound when in an adverse direction, either directly or approximately. He also recommends the adoption of an automatic pump to supply the boilers with water, and also to open and shut the valves at the proper intervals for blowing the whistle. He states that the location of a sound can be determined more precisely in the case of loud, high sounds than in that of feebler or lower ones. On this point I am not prepared to concur with him in experiments of my own. In all cases however loud sounds are more desirable than feebler ones, in order that they may be heard at a greater distance above the noise of the surf and that of the wind as it passes through the spars and rigging of vessels.

The board however at this time were not prepared to adopt these suggestions, and an unsuccessful attempt to use a steam-boiler, rendered abortive by the incapacity of the keeper to give it proper attendance, discouraged for a time efforts in this line.

Previous to the investigations of Mr. Alexander, at the expense of the Light House Board, Mr. Daboll, of New London, had for several years been experimenting on his own account with reference to a fog-signal. His plan consisted in employing a reed trumpet, constructed after the manner of a clarionet, and sounded by means of air condensed in a reservoir, the condensation being produced by horse-power operating through suitable machinery. Although the sound of this was more penetrating than that of bells, still the expense and inconvenience of the maintenance of a horse, together with the cost of machinery, prevented its adoption. Mr. Daboll however after this presented to the board a

modification of his invention, in which a hot-air engine of Ericsson's patent was substituted as the motive power, instead of the horse; and the writer of this report, as chairman of the committee on experiments in behalf of the board, examined this invention and reported in favor of its adoption. The other members of the committee made an unfavorable report, on the ground that fog-signals were of little importance, since the mariner should know his place by the character of his soundings in all places where accurate surveys had been made, or should not venture near the coast until the fog was dissipated. The board however established Daboll trumpets at different stations, which have been in constant use up to the present time.

PART I.—INVESTIGATIONS FROM 1865 TO 1872.*

Experiments near New Haven, in 1865.

The subject of sound, in connection with fog-signals, still continued to occupy the attention of the board, and a series of investigations was made in October, 1865, at the light-house near New Haven, under the direction of the writer of this report, in connection with Commodore, now Admiral, Powell, inspector, and Mr. Lederle, acting engineer of the third district.

The principal object was to compare the sound of bells, of steam-whistles, and other instruments, and the effect of reflectors, and also the operation of different hot-air engines. For this purpose the committee was furnished with two small sailing-vessels. As these were very imperfectly applicable, since they could not be moved without wind, the writer of the report devised an instrument denominated an "artificial ear," by which the relative penetrating power of different sounding bodies could be determined and expressed in numbers by the removal of the observer to a comparatively short distance from the point of origin of the sound. This instrument consisted of a conical horn, made of ordinary tinned sheet-iron, the axis of which was about 4 feet in length, the diameter of the larger end 9 inches, and tapering gradually to $1\frac{3}{4}$ of an inch at the smaller end. The axis of this horn was bent at the smaller end in a gentle curve, until the plane of the section of the smaller end was at right angles to the perpendicular section of the larger end, so that when the axis of the trumpet was held horizontally and the larger section vertically, then the section of the smaller end would be horizontal. Across the smaller end a thin membrane of gold-beater's skin was slightly stretched and secured by a thread. On this membrane fine sand was strewn. To protect the latter from disturbance by the wind, it was surrounded by a cylinder of glass, cut from a lamp-chimney, the upper end of which was covered with a plate of glass; and, in the improved condi-

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* From the Report of the Light-House Board, for 1874.

tion of the instrument, with a magnifying lens, with which to observe more minutely the motions of the sand. To use this instrument in comparing the relative penetrating power of sound from different sources, as for example from two bells, the axis being held horizontal, the mouth was turned toward one of the bells, and the effect causing agitation of the sand, was noted. The instrument was then removed to a station a little further from the bell, and the effect again noted, the distance being increased, step by step, until no motion in the sand could be observed through the lens. This distance, being measured in feet or yards, gave the number indicating the penetrating power of the instrument under trial. The same experiment was immediately repeated, under the same conditions of temperature, air, wind, &c., with the other sounding apparatus, and the relative number of yards indicating the distance, taken as the penetrating powers of the two instruments. It should be observed, in the use of this instrument, that it is intended merely to concentrate the rays of sound, and not to act as a resounding cavity; since in that case the sound, in unison with the resounding note, would produce effect at a greater distance than one in discord.

The indications of this instrument were compared with the results obtained by the ear in the use of the two vessels, and in all cases were in exact accordance; and it was accordingly used in the following investigations, and has been found of great service in all subsequent experiments on the penetration of sound.

The only precaution in using it is that the membrane shall not be of such tension as to vibrate in unison with a single sound or its octaves; or, in other words, that the instrument must be so adjusted by varying the length of the axis or the tension of the membrane that it shall be in discordance with the sounds to be measured, and only act as a condenser of the sonorous waves.

The first experiments made were with regard to the influence of reflectors. For this purpose a concave wooden reflector had been prepared, consisting of the segment of a sphere of 16 feet radius, and covered with plaster, exposing a surface of 64 square feet. In the focus of this, by means of a temporary railway, a bell or whistle could be readily introduced or withdrawn. The center of the mouth of the bell was placed in the horizontal axis of the reflector. This arrangement being completed, the sound of the bell, with and without the reflector behind it, was alternately observed. Within the distance of about 500 yards the effect was evidently increased, as indicated by the motion of the sand on the membrane, but beyond this the difference was less and less perceptible, and at the limit of audibility the addition of the reflector appeared to us entirely imperceptible. This result was corroborated by subsequent experiments in which a whistle was heard nearly as well in the rear of a reflector as before it. It would appear from these results that while feeble sounds, at small distances, are reflected as rays of light are, waves

of powerful sound spread laterally, and even when projected from the mouth of a trumpet, tend at a great distance to embrace the whole circle of the horizon.

Upon this and all the subsequent experiments, as it will appear, the principle of reflection as a means of re-enforcing sound is but slightly applicable to fog-signals. It is evident however that the effect will be somewhat increased by augmenting the size of the reflector, and by more completely inclosing the source of sound in a conical or pyramidal reflector.

Another series of experiments was made to ascertain whether the penetration of the sound was greater in the direction of the axis of the bells, or at right angles to the axis; or, in other words, whether the sound was louder in front of the mouth of a bell or of its rim. The result of this experiment was considered of importance, since, in one of the light-houses, a bell has been placed with the plane of its mouth at right angles to the horizon, instead of being placed, as usual, parallel to the same. The effect on the sound in these two positions was similar to that produced by the bell with a reflector, the noise being greater at a short distance with the mouth toward the observer than when the rim was in the plane of the ear. At a distance however, the difference between the two sounds was imperceptible. In practice therefore it is of very little importance whether the axis of the bell is perpendicular or parallel to the horizon.

The first fog-signal examined in this series of experiments was a double whistle, improperly called a steam-gong, designed principally for a fire-alarm and for signals for the commencement of working-hours in large manufacturing establishments. It consisted of two bells of the ordinary steam-whistle on the same hollow axis, mouth to mouth, with a flat, hollow cylinder between them, through the upper and lower surface of which the circular sheets of steam issue, the vibration of which produces the sound. In the instrument under examination, the upper bell was 20 inches in length of axis, and 12 inches in diameter, and the lower-whistle was of the same diameter, with a length of axis of 14 inches. The note of the shorter bell was a fifth above that of the longer. This arrangement gave a melodious sound, unlike that of the ordinary locomotive-whistle, and on that account had a peculiar merit. The sound was also very loud, and, according to testimony, had been heard under favorable circumstances more than twenty miles. It however required a large quantity of steam to give it its full effect, and the only means to obtain an approximate idea as to this quantity was that afforded by observing its action on a boiler of a woolen manufactory near Newport. It was here blown with a pressure of at least 75 pounds. From theoretical considerations however, it might be inferred that its maximum penetrating power would be not greater than that of a single whistle using the same amount of steam, and this theoretical inference was borne out by the subsequent experiments of General Duane. But from the strikingly

distinctive character of its tone it has, in our opinion, an advantage over a single whistle expending an equal quantity of steam.

The fact that the vibration of the metal of the bell had no practical effect on the penetrating power of the sound was proved quite conclusively by winding tightly around each bell, over its whole length, a thick cord, which would effectually stop all vibration. The penetration of the sound produced under this condition was the same as that with the bells free. It is true, the latter produces a difference in the quality of the tone, such as that which is observed in a brass instrument and that of one of wood or ivory. The inventor was not aware that the sound produced was from the resonance of the air within the bell, and not from the metal of the bell itself, and had obtained a patent, not only for the invention of the double whistle, but also for the special compound of metal of which it was composed.

Another apparatus proposed to be used as a fog-signal was presented for examination by the Marine Signal Company, of Wallingford, Conn. It consisted of a curved tube of copper nearly in the form of the letter C, and was supported on an axis passing through the center of the figure. An ordinary bell-whistle was attached to each extremity of the tube, the instrument being placed in a vertical position and partially filled with water, then made to oscillate on its center of support. By this means the air was drawn in at one end and forced out through the whistle at the other. The motion being reversed the air was drawn in at the end through which it had just made its exit and forced out through the whistle at the other. By rocking the instrument, either by hand or by the motion of the vessel, a continued sound could be produced. The motive-power in the former case was muscular energy, and the experiments which were made at this time, as well as all that have been made subsequently, conclusively prove that the penetrating power of the sound for practical use as a fog-signal depends upon the intensity of the motive-energy employed. No instrument operated through levers and pumps by hand-power is sufficient for the purpose.

One of these instruments with two 4-inch whistles gave a sound, as indicated by the artificial ear, the power of which was about one-tenth of that of a steam-trumpet. It was supposed however that this instrument would be applicable for light-ships; and that if extended entirely across the vessel, and armed with whistles of large size, it would be operated by the rolling of the vessel, and thus serve to give warning in time of thick weather. But as it frequently happens that fog exists during a calm, this invention could not be relied upon to give warning in all cases of danger. Besides this, the ordinary roll of a ship is not sufficient to produce a hydrostatic pressure of more than five or six pounds to the square inch, which is insufficient to give an effective sound. It has however been proposed to increase the power by using quicksilver instead of water; but, besides the first cost of this material, and the constant loss by leakage and oxidation, the tendency to affect

the health of the crew is an objection to the introduction of this modification of the apparatus into light-ships.

The other instruments which were subjected to trial were an ordinary steam-whistle and a Daboll trumpet. The bell of the whistle was 6 inches in diameter, 9 inches in height, and received the sheet of steam through an opening of one-thirtieth of an inch in width; was worked by a pressure of condensed air of from 20 to 35 pounds per square inch, and blown once in a minute for about five seconds. The air was condensed by a Roper engine of one-horse power. The penetrating power of the sound was increased by an increase in the pressure of the air, and also the pitch. The tone however of the instrument was lowered by increasing the distance between the orifice through which the circular sheet of air issued at the lower rim of the bell or resounding cavity. To prove conclusively that the bell performs the part of a mere resounding cavity, a wooden one, on a subsequent occasion, was substituted for that of metal without a change in the loudness or the pitch of the sound.

The penetrating power of the whistle was compared with a Daboll trumpet, actuated by an Ericsson engine of about the same power; the reservoir for the condensed air of each machine was furnished with a pressure-gauge, and by knowing the capacity of the condensing pumps and the number of strokes required to produce the pressure, the relative amount of power was determined. The result was that the penetrating power of the trumpet was nearly double that of the whistle, and that an equal effect was produced at the same distance by about one-fourth of the power expended in the case of the latter. It must be recollected however, that the whistle sends sonorous waves of equal intensity in every direction, while the greatest power of the trumpet is in the direction of its axis. This difference however is lessened on account of the spreading of the sound to which we have before alluded.* The whistle was blown, as we have said, with a pressure of from 20 to 35 pounds, while the trumpet was sounded with a pressure of from 12 to 15 pounds. In the case of the whistle, the pressure in the reservoir may be indefinitely increased with an increase in the penetrating power of the sound produced, while in the case of the trumpet a pressure greater than a given amount entirely stops the blast by preventing the recoil of the vibrating tongue; this being made of steel, in the larger instruments $2\frac{1}{2}$ inches wide and 8 inches long, would receive a pressure of steam, at only 10 pounds to the square inch, of 200 pounds, tending to press it into the opening and to prevent its recoil, this circumstance limits, as it were, the power of a trumpet of given dimensions. It is however well fitted to operate with a hot-air engine, and is the least expensive in fuel of any of the instruments now employed. The whistle is the simpler and easier of management, although they both require arrangement of machinery in order that they may be operated automatically.

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* It is worthy of note however that in the case of a sound having primarily an axial direction, the subsequent lateral diffusion must result in enfeebling the whole sphere of expanding sound-waves in a more rapid ratio than the square of the distance.

It is a matter of much importance to obtain a hot-air engine of sufficient power, and suitable for working fog-signals of all classes. This will be evident when we consider the difficulty in many cases of obtaining fresh water for producing steam, and the expense of the renewal of the boilers in the use of salt-water, as well as that of the loss of power in frequently blowing out the latter, in addition to the danger of the use of steam by unskillful attendants.

The merits of the two engines however under consideration could not be fully tested by the short trial to which they were subjected during these experiments. The principal objection to the Ericsson engine was the size of the fly-wheel and the weight of the several parts of the machine; the Roper engine was much more compact, and appeared to work with more facility, but from the greater heat imparted to the air the packing was liable to burn out and required to be frequently renewed. Although at first the impression of the committee was in favor of the Roper engine, yet in subsequent trials of actual practice it was found too difficult to be kept in order to be employed for light-house purposes, and its use has consequently been abandoned; another hot-air engine has been employed by the board, the invention of a Mr. Wilcox, which has also been discontinued for a similar reason. I was assured by the person last named, a very ingenious mechanician, that when the several patents for hot-air engines expired, a much more efficient instrument could be devised by combining the best features of each of those now in use.

For determining the relative penetrating power of these instruments, the use of two vessels had been obtained, with the idea of observing the sound simultaneously in opposite directions.

Unfortunately however the location which had been chosen for these experiments was of a very unfavorable character in regard to the employment of sailing-vessels and the use of the artificial ear. It was fully open to the ocean only in a southerly direction, navigation up the bay to the north being limited to three and a half miles, while on shore a sufficient unobstructed space could not be obtained for the proper use of the artificial ear. With these obstructions and the necessity of beating against the wind, thereby constantly altering the direction of the vessel, exact comparisons were not possible, yet the observations made were sufficiently definite to warrant certain conclusions from them as to the relative power of the various instruments submitted to examination.

The following is a synopsis of the observations on four different days. Before giving these however, it is necessary to observe that at each stroke of the piston of the hot-air engine a loud sound was produced by the blowing off of the hot air from the cylinder, after it has done its work. In the following statement of results the noise thus produced is called the exhaust. On the first day but one set of observations was made, the vessel's course being nearly in the line of the axis of the trumpet. The

order of penetrating power was as follows: 1, trumpet; 2, exhaust; 3, bell; these instruments being heard respectively at $5\frac{1}{8}$, $3\frac{1}{2}$, and 2 miles. The whistle was not sounded.

The second day simultaneous observations were made from two vessels sailing nearly in opposite directions. The results of the observations made on the vessel sailing in a southerly direction were very irregular. The trumpet was heard at $3\frac{5}{8}$ miles and lost at $4\frac{3}{8}$ miles with the wind slightly in favor of the sound, and heard at $6\frac{1}{4}$ miles with the wind somewhat against the sound; it was heard even at $7\frac{5}{8}$ miles from the masthead, though inaudible from the deck. In all these cases the position of the vessel was nearly in line with the axis of the trumpet.

The whistle and exhaust were heard at $7\frac{1}{4}$ miles with a feeble opposing wind, and lost at $6\frac{1}{4}$ miles when the force of the wind became greater.

The order of penetration in this series of observations was: 1, trumpet and gong; 2, whistle; 3, exhaust.

In the case of the vessel sailing northward, its course being almost directly against the wind and in the rear of the trumpet, all the sounds were lost at less distances than in the case of the other vessel. The observations showed very clearly the effect of the wind, the bell at a certain distance being heard indistinctly with a strong opposing wind and more and more plainly as the wind died away. The trumpet was heard only as far as the whistle, the vessel being in the rear of lt.

The third day observations were made from the two vessels, both however sailing to the south. From the vessel sailing at right angles to the direction of the wind the order of penetration was: 1, trumpet; 2, whistle; 3, exhaust; 4, bell.

In the case of the other vessel the opposing effect of the wind was greater, and the sounds were heard to a less distance; the order was: 1, trumpet; 2, whistle; 3, exhaust; 4, bell; 5, rocker.

On the fourth day two trips were made by the same vessel in the course of the day, one being northward and the other southward. In the first case the trumpet was lost at $3\frac{1}{8}$ miles, the vessel being nearly in its rear; in the second case, the wind being almost directly opposed to the sound, the large bell was heard at $1\frac{1}{8}$ miles, and lost at $\frac{7}{8}$ of a mile, probably due to increase of the force of the wind; the trumpet was was lost at $3\frac{1}{2}$ miles.

In all these observations, owing to the unfavorable conditions of the locality, and the direction of the wind, we were unable to obtain any satisfactory observations on sound moving with the wind. In all cases the results were obtained from sounds moving nearly against the wind, or at right angles to it. From the results of the whole it appears that the sound was heard farther with a light opposing wind than with a stronger one, and that it was heard farthest of all at right angles to the wind. From this latter fact, however, it should not be inferred that in this case sound could be heard farther at right angles to the wind than with the wind, but that in this direction the effect of the wind was neu-

tralized. The results also exhibited, in a striking manner, the divergency of sound from the axis of the trumpet, the trumpet being heard in the line of its axis in front at 6 miles and behind at 3, the wind being nearly the same in both cases.

All the observations were repeated on land with the artificial ear as far as the unfavorable condition of the surface would permit. Although the limit, as to distance, at which the sand might be moved was not in most cases observed, yet the relative degree of agitation at a given distance established clearly which was the most powerful instrument, the result giving precisely the same order of penetration of the different instruments as determined by direct audition.

During this series of investigations an interesting fact was discovered, namely, a sound moving against the wind, inaudible to the ear on the deck of the schooner, was heard by ascending to the mast-head. This remarkable fact at first suggested the idea that sound was more readily conveyed by the upper current of air than the lower, and this appeared to be in accordance with the following statement of Captain Keeney, who is commander of one of the light-house vessels, and has been for a long time on the banks of Newfoundland in the occupation of fishing: "When the fishermen in the morning hear the sound of the surf to the leeward, or from a point toward which the wind is blowing, they take this as an infallible indication that in the course of from one to five hours the wind will change to the opposite direction from which it is blowing at the time." The same statement was made to me by the intelligent keeper of the fog-signal at Block Island. In these cases it would appear that the wind had already changed direction above, and was thus transmitting the sound in an opposite direction to that of the wind at the surface of the earth.

Another remarkable fact bearing on this same point is established by the observations of General Duane. At Cape Elizabeth, 9 miles southeasterly from the general's house, at Portland, is a fog-signal consisting of a whistle 10 inches in diameter; at Portland Head, about 4 miles from the same city, in nearly the same direction, is a Daboll trumpet. There can be no doubt, says the general, that those signals can be heard much better during a heavy northeast snow-storm than at any other time. "As the wind increases in force, the sound of the nearer instrument, the trumpet, diminishes, but the whistle becomes more distinct; but I have never known the wind to blow hard enough to prevent the sound of the latter from reaching this city." In this case, the sound comes to the city in nearly direct opposition to the course of the wind, and the explanation which suggested itself to me was that during the continuance of the storm, while the wind was blowing from the northeast at the surface, there was a current of equal or greater intensity blowing in an opposite direction above, by which the sound was carried in direct opposition to the direction of the surface current. The existence of such an upper current is in accordance with the hypothesis of the character of a north-

east storm, which sometimes rages for several days at a given point on the coast without being felt more than a few miles in the interior, the air continuously flowing in below and going out above. Indeed, in such cases a break in the lower clouds reveals the fact of the existence above of a rapid current in the opposite direction.

The full significance, however, of this idea did not reveal itself to me until in searching the bibliography of sound I found an account of the hypothesis of Professor Stokes in the Proceedings of the British Association for 1856,* in which the effect of an upper current in deflecting the wave of sound so as to throw it down upon the ear of the auditor, or directing it upward far above his head, is fully explained. This subject will be referred to in the subsequent parts of the report, in the attempt to explain various abnormal phenomena of sound which have been observed during the series of investigations connected with the Light-House Board.

During these investigations an attempt was made to ascertain the velocity of the wind in an upper stratum as compared with that in the lower. The only important result however, was the fact that the velocity of the shadow of a cloud passing over the ground was much greater than that of the air at the surface, the velocity of the latter being determined approximately by running a given distance with such speed that a small flag was at rest along the side of its pole. While this velocity was not perhaps greater than six miles per hour, that of the shadow of the cloud was apparently equal to that of a horse at full speed.

During this and subsequent investigations, inquiries were made in regard to the effect of fog upon sound, it being a subject of considerable importance to ascertain whether waves of sound, like the rays of light, are absorbed or stifled by fog. On this point, however, observers disagree. At first sight, from the very striking analogy which exists in many respects between sound and light, the opinion largely prevails that sound is impeded by fog; although observers who have not been influenced by this analogy have, in many instances, adopted the opposite opinion, that sound is better heard during a fog than in clear weather. For instance, the Rev. Peter Ferguson, of Massachusetts, informs me that from his own observations, sound is conveyed farther in a fog than in a clear air. He founds this opinion on observations which he has made on the sound of locomotives of several railways in passing over bridges at a distance. Unfortunately, the question is a difficult one to settle, since the effect of the wind, in order to arrive at a true result, must be carefully eliminated. Captain Keeney, who has previously been mentioned, related the following occurrence, in the first part of which he was led to suppose that fog had a very marked influence in deadening sound, though in a subsequent part he came to an opposite conclusion: He was sailing during a dense fog, with a slight wind bear-

* Report of British Association, 1856; Abstracts, p. 22.

ing him toward a light-vessel, the locality of which he expected to find by means of the fog-signal. He kept on his course until he thought himself very near the ship, without hearing the stroke of the bell. He then anchored for the night, and found himself next morning within a short distance of the light-vessel, but still heard no sound, although he was assured when he got to it that the bell had been ringing all night. He then passed on in the same direction in which he had previously sailed, leaving the light-vessel behind, and constantly heard the bell for a distance of several miles, the density of the fog not perceptibly diminishing. In this case it is evident that the deadening of the sound was not due to the fog, but, as we shall hereafter see, in all probability to the combined action of the upper and the lower currents of air.

On returning to Washington the writer took advantage of the occurrence of a fog to make an experiment as to the penetration of the sound of a small bell rung by clock-work, the apparatus being the part of a moderator-lamp intended to give warning to the keepers when the supply of oil ceased. The result of the experiment was contrary to the supposition of absorption of the sound by the fog, but the change in the condition of the atmosphere as to temperature and the motion of the air, before the experiment could be repeated in clear weather, rendered the result not entirely satisfactory.

Experiments at Sandy Hook in 1867.

The next series of experiments was made from October 10 to October 18, 1867, under the direction of the writer of this report, in connection with General Poe, engineer-secretary of the Light-House Board, Commodore (now Admiral) Case, then inspector of the third light-house district, and Mr. Lederle, acting engineer of the same district.

The principal object of these investigations was to compare different instruments, and to ascertain the improvements which had been made in them since the date of the last investigations, especially the examination of a new fog-signal called the siren, and the comparison of it with the Daboll trumpet, although other investigations were made relative to the general subject of sound in relation to fog-signals. The locality chosen was Sandy Hook, a narrow peninsula projecting northward, about five miles into the middle of the Lower Bay of New York, and almost at right angles to its coast, having a width of about half a mile. Near the northern point on the east shore a temporary building was erected for the shelter of the engines and other instruments.

The comparisons in regard to penetrating power were made by the use of the artificial ear, heretofore described, by carrying this off a measured distance until the sand ceased to move. This operation was much facilitated by previous surveys of members of the Engineer Corps, who had staked off a straight line parallel with the shore, and accurately divided it into equal distances of 100 feet.

On account of the character of the deep and loose sand, walking

along this distance was exceedingly difficult, and, to obviate this, a carriage with broad wheels, drawn by two horses, was employed. An awning over this vehicle protected the observer from the sun, and enabled him, without fatigue and at his ease, to note the agitations of sand on the drum of the artificial ear, the mouth of which was directed from the rear of the carriage toward the sounding instrument.

For these and other facilities we were indebted to General Humphreys, Chief of the Engineer Bureau, who gave orders to the officer in charge of the military works at Sandy Hook to afford us every aid in his power in carrying on the investigation.

The instruments employed were—

1st. A first-class Daboll trumpet (the patent for which—since the death of Mr. Daboll, is owned by Mr. James A. Robinson,) operated by an Ericsson hot-air engine. It carried a steel reed 10 inches long, $2\frac{3}{4}$ inches wide, and $\frac{1}{2}$ inch in thickness at the vibrating end, but increasing gradually to an inch at the larger extremity. This was attached to a large vertical trumpet curved at the upper end into a horizontal direction and furnished with an automatic arrangement for producing an oscillation of the instrument of about 60° in the arc of the horizon. Its entire length, including the curvature, was 17 feet. It was $3\frac{1}{2}$ inches at the smaller end and had a flaring mouth 38 inches in diameter. The engine had a cylinder 32 inches in diameter, with an air-chamber of $4\frac{1}{2}$ feet in diameter and 6 feet long, and was able to furnish continually a five-second blast every minute at a pressure of from 15 to 30 pounds.

2d. A siren, originally invented by Cagniard de Latour, and well known to the physicist as a means of comparing sounds and measuring the number of vibrations in different musical notes. Under the direction of the Light-House Board, Mr. Brown, of New York, had made a series of experiments on this instrument in reference to its adoption as a fog-signal, and these experiments have been eminently successful. The instrument as it now exists differs in two essential particulars from the original invention of Latour: 1st, it is connected with a trumpet in which it supplies the place of the reed in producing the agitation of the air necessary to the generation of the sound; and 2d, the revolving disk, which opens and shuts the orifices producing the blasts, is driven not by the blast itself impinging on oblique openings, as in the original instrument, but by a small engine connected with the feed-pump of the boiler.

The general character of the instrument may be understood from the following description: Suppose a drum of short axis, into one head of which is inserted a steam-pipe connected with a locomotive-boiler, while the other end has in it a triangular orifice, through which the steam is at brief intervals allowed to project itself. Immediately before this head, and in close contact with it, is a revolving disk, in which are eight orifices. By this arrangement, at every complete revolution of the disk, the orifice in the head of the drum is opened and shut eight times in

succession, thus producing a rapid series of impulses of steam against the air into the smaller orifice of the trumpet placed immediately in front of the revolving disk. These impulses are of such intensity and rapidity as to produce a sound unrivalled in magnitude and penetrating power by that of any other instrument yet devised.

The siren was operated by an upright cylindrical tubular boiler, with a pressure of from 50 to 100 pounds on the square inch. For this form of boiler has been subsequently substituted an ordinary horizontal locomotive-boiler with a small engine attached for feeding it and for rotating the disk, the latter being effected by means of a band passing over pulleys of suitable relative dimensions.

3d. A steam-whistle 8 inches in diameter. Through some misunderstanding a series of whistles of different diameters was not furnished as was intended.

The first experiments to be noted were those in regard to the comparison of penetrating power of the siren and the whistle, the fitting up of the Daboll trumpet not having been completed. The principal object of this however was to test again the truthfulness of the indications of the artificial ear in comparison with those of the natural ear.

An experiment was made both by means of the artificial ear on land and by actually going off on the ocean in a steamer until the sounds became inaudible to the natural ear. By the latter method the two sounds ceased to be heard at the distances of six, and twelve and a half miles, respectively. The indications of the artifical ear gave a similar result, the distance at which the sand ceased to move in one case being double that of the other. In both cases the conditions of wind and weather were apparently the same. In the case of the steamer the distance was estimated by noting the interval of time between the flash of steam and the perception of the sound.

Comparison of the Daboll trumpet and the siren.—The pressure of the hot air in the reservoir of the hot-air engine of the trumpet was about 20 pounds, and that of the steam in the boiler of the siren about 75 pounds. These pressures are however not considered of importance in these experiments, since the object was not so much to determine the relative amount of motive power employed as the amount of penetrating power produced by these two instruments, each being one of the first of its class.

1. At distance 50 the trumpet produced a decided motion of the sand, while the siren gave a similar result at distance 58. The two observations being made within ten minutes of each other, it may be assumed that the condition of the wind was the same in the two cases, and hence the numbers above given may be taken as the relative penetrating power of the two instruments.

2. Another series of experiments was instituted to determine whether a high or a low note gave the greatest penetration. For this purpose the

siren was sounded with different velocities of rotation of the perforated disk, the pressure of steam remaining at 90 pounds per square inch. The effect upon the artificial ear in causing greater or less agitation of sand was taken as the indication of the penetrating power of the different tones. The number of revolutions of the disk in a given time was determined by a counting apparatus, consisting of a train of wheels and a series of dials showing tens, hundreds, and thousands of revolutions; this was temporarily attached to the projecting end of the spindle of the revolving disk by pushing the projecting axis of the instrument into a hole in the end of the spindle.

From the whole of this series of experiments it appeared that a revolution which gave 400 impulses in a second was the best with the siren when furnished with a trumpet. On reflection however it was concluded that this result might not be entirely due to the pitch, but in part to the perfect unison of that number of impulses of the siren with the natural tone of the trumpet. To obviate this complication, a series of experiments was next day made on the penetration of different pitches with the siren alone, the trumpet being removed. The result was as follows:

The siren was sounded at five different pitches, the artificial ear being at such a distance as to be near the limit of disturbance by the sound. In this condition the lowest pitch gave no motion of sand. A little higher, slight motion of sand. Still higher, considerable motion of sand; and with a higher pitch again, no motion of sand. The best result obtained was with a revolution which gave 360 impulses in a second.

3. An attempt was made to determine the most effective pitch or tone of the steam-whistle. It was started with what appeared to be the fundamental note of the bell, which gave slight motion of sand; a higher tone a better motion; still higher, sand briskly agitated; next, several tones lower, no motion; higher, no motion; still higher, no motion. The variation in the tone was made by altering the distance between the bell and the orifice through which the steam was ejected.

The result of this experiment indicated nothing of a definite character, other than that with a given pressure there is a maximum effect produced when the vibrations of the sheet of air issuing from the circular orifice are in unison with the natural vibrations from the cavity of the bell, a condition which can only be determined in any case by actual experiment. In practice, Mr. Brown was enabled to produce the best effect by regulating the velocity until the trumpet gave the greatest penetrating power, as indicated by an artificial ear of little sensibility, in order that it might be employed for determining the relative power while the observer was but a few yards from the machine.

These experiments have been made in an apartment of less than 80 feet in length, in which the sounding apparatus was placed at one end

and the artificial ear at the other, substituting fine shot instead of sand.

The experiments with the siren however indicate the fact that neither the highest nor the lowest pitch of an instrument gives the greatest penetrating power, but one of a medium character.

Another element of importance in the construction of these instruments is the volume of sound. To illustrate this, it may be mentioned that a harpsichord-wire stretched between two strings of India rubber, when made to vibrate by means of a fiddle-bow, gives scarcely any appreciable sound. We attribute this to the want of quantity in the aerial wave; for if the same wire be stretched over a sounding-board having a wide area, the effect will be a comparatively loud sound, but of less duration, with a given impulse. It was therefore suggested that the width of the reed in the Daboll trumpet, the form and size of the holes in the disk of the siren, and the circumference of the vibrating sheet of air issuing from the circular orifice of the whistle, would affect the power of the sound. The only means of testing this suggestion is by using reeds of different widths, sirens with disks of different-shaped openings, and whistles of different diameters. In conformity with this view, Mr. Brown has made a series of empirical experiments with openings of different forms, which have greatly improved the operation of the siren, while Mr. Wilcox has experimented on several forms of reeds, of which the following is the result:

The best reed obtained was $2\frac{1}{4}$ inches wide, 8 inches long in the vibrating part, $\frac{5}{8}$ inch thick at the butt, and $\frac{1}{4}$ inch thick at the free end. This sounded at a pressure of from 20 to 30 pounds. The thinner reeds gave a sound at a less pressure, from 5 to 10 pounds, the thicker at from 20 to 30 pounds. A reed $8\frac{1}{2}$ inches long in the vibrating part, 1 inch thick at the butt, $\frac{3}{4}$ inch thick at the end, and 3 inches wide, did not begin to sound until a pressure of 80 pounds was reached, then gave a sound of a dull character. Another reed of the same width, $\frac{5}{8}$ inch thick at the butt, and $\frac{7}{16}$ inch at the end, and same length, gave a sound at 75 pounds pressure, but still dull and of little penetrating power. These reeds were evidently too heavy in proportion to their elasticity. These were made without the addition of a trumpet, and therefore to produce the best result when used with a trumpet, the latter must be increased or diminished in length until its natural vibrations are in harmony with those of the former, as will be seen hereafter. General Duane has also made experiments on whistles of different diameters, of which the result will be given.

Another consideration in regard to the same matter is that of the amplitude of the oscillations of the tongue or steel reed in its excursion in producing the sound; the time of oscillation remaining the same, that is, the pitch, the amplitude will depend upon the elasticity of the reed, the power to surmount which will again depend upon the pressure of steam in the boiler, and hence we might infer that an increase of pres-

sure in the boiler with an increase of the elasticity of the reed, everything else being the same, would produce an increase in penetrating power. From the general analogy of mechanical effects produced by motive power, we may denote the effect upon the ear by the expression mv^2, in which m expresses the mass or quantity of air in motion, and v the velocity of the particles in vibration.

If this be the expression for the effect upon the ear, it is evident that in case of a very high note the amplitude of the vibration must be so small that the effect would approximate that of a continued pressure rather than that of distinct alternations of pressure, giving a vibrating motion to the drum of the ear.

4. Next, experiments were made to determine the penetrating power in the case of the siren under different pressures of steam in the boiler. The experiments commenced with a pressure of 100 pounds. The pressure at each blast was noted by two observers, and to compare these pressures with the indications of the sand, the time of the blasts was also noted.

The following are the results:

Pressure.	Relative distances at which the sand ceased to move.
100	61
90	59
80	58
70	57
60	57
50	56
40	55
30	53
20	51

From this series of experiments, it appears that a diminution of pressure is attended with a comparatively small diminution in the penetrating power of the siren.

In regard to this unexpected result of great practical importance, the following appears to be the explanation. It is a well-known principle in aerial mechanics that the velocity of the efflux of air from an orifice in a reservoir does not increase with an increase of condensation, when the spouting is into a vacuum. This is evident when we reflect that the weight of density of the air moving out is increased in proportion to the elasticity or pressure; that is, the increase in the propelling force is proportional to the increase in the weight to be moved, hence the velocity must remain the same.

In the foregoing experiments with high pressures large in proportion to the resistance of the air, the velocity of efflux should therefore be but little increased with the increase of pressure, and inasmuch as the velocity is the most important factor in the expression mv^2, which indicates the effect on the tympanum, the penetrating power of the sound should be in accordance with the above experimental results.

A similar result cannot be expected with the use of the whistle or the trumpet, since in the former the stiffness of the aerial reed depends upon its density, which will be in proportion to the pressure in the boiler, and in the case of the latter no sound can be produced on the one hand unless the pressure be sufficient to overcome the resistance of the reed, and on the other the sound must cease when the pressure is so great as to prevent the recoil of the reed.

5. An experiment was made to determine the effect of a small whistle inserted into the side of a trumpet near the small end. The whistle being sounded before and after it was placed in the trumpet, the result was as follows: The penetrating powers were in the ratio of 40: 51, while the tone was considerably modified. From this experiment it appears that a whistle may be used to actuate a trumpet or to exercise the functions of a reed. In order however to get the best results, it would be necessary that the trumpet and whistle should be in unison, but it may be doubted however whether an increase of effect, with a given amount of power, would result from using such an arrangement; it might nevertheless be of advantage in certain cases to direct the sound of a locomotive in a definite direction, and to use a smaller whistle, especially in cities, in which the locomotive passes through long streets; perhaps in this case the sound might be less disagreeable than that of the naked whistle, which sends its sound-waves laterally with as much force as in the direction of the motion of the engine.

6. General Poe called attention to the sound produced by the paddle-wheels of a steamer in the offing at a distance estimated at four and a half miles. The sound was quite distinct when the ears were brought near the surface of the beach.

In this connection he stated that he had heard the approach of a small steamer on the northern lakes when its hull was still below the horizon, and was even enabled to designate the particular vessel from among others by the peculiarity of the sound.

The sound in the case of the steamer is made at the surface of the water, and it might be worth the trouble to try experiments as to the transmission of sound under this condition, and the collection of it by means of ear-trumpets, the mouths of which are near the water, the sound being conveyed through tubes to the ears of the pilot. In order however to determine in this case the direction of the source of sound, two trumpets would be necessary, one connected with each ear, since we judge of the direction of a sound by its simultaneous effects on the two auditory nerves. This suggestion, as well as many others which have occurred in the course of these researches, is worthy of special investigation.

7. A series of experiments was made to compare trumpets of different materials and forms having the same length and transverse areas, all blown at a pressure of $9\frac{1}{2}$ pounds.

The following table gives the results:

No.	Material of trumpet.	Cross-section.	Relative distances at which the sand ceased to move.
1	Wood.	Square.	13
2	Brass.	Circular.	23
3	Cast iron.	Circular.	24
4	Wood.	Circular.	30

From these experiments it would appear that the material or elasticity of the trumpet had little or no effect on the penetrating power of the sound, although the shape appeared to have some effect, the pyrimidal trumpet, or one with square cross-section (No. 1), giving a less result than the conical ones of the same sectional area. A comparison was made between a long straight trumpet and one of the same length curved at its upper end, which gave the same penetrating power with the same pressure. It is probable that a thin metallic trumpet would give greater lateral divergency to the sound, and also a slightly different tone.

8. The effect of a hopper-formed reflector was next tried with the whistle, the axis of which was about 5 feet in length, the mouth 6 feet square, and the small end about 18 inches. When the whistle was sounded at the small end of this reflector, the distance at which the sand ceased to move was 51; the sound of the same whistle without the reflector ceased to move the sand at 40. The ratio of these distances would have been less with a more sensitive instrument at a greater distance on account of the divergency of the rays.

9. In order to determine the diminution of sound by departing from the axis of the trumpet, a series of experiments was made with a rotating trumpet, the axis of which was at first directed along the graduated line of observation, and subsequently deflected from that line a given number of degrees. The following were the results:

Direction of the trumpet.	Relative distance at which sand moved.
Along the line	26
Deflected 30°	23
Deflected 60°	21
Deflected 90°	18
Deflected 120°	13

These results illustrate very strikingly the tendency of sound to spread on either side of the axis of the trumpet; had the experiments been made with a more sensitive instrument, and at a greater distance, the effect

would have shown a much greater divergency. It should be observed however that the mouth of the trumpet in this case was 36 inches, which is unusually large.

From the experiments made near New Haven, and also from those at this station, it appears that the actual amount of power to produce sound of a given penetration is absolutely less with a reed trumpet than with a locomotive whistle. This fact probably finds its explanation in the circumstance that in each of these instruments the loudness of the sound is due to the vibration of the air in the interior of the trumpet and in the bell of the whistle, each of these being a resounding cavity; and furthermore that in these cavities the air is put in a state of sustained vibration by the undulations of a tongue, in the one case of metal, in the other of air; and furthermore it requires much more steam to set the air in motion by the tongue of air than by the solid tongue of steel, the former requiring a considerable portion of the motive power to give the current of which it consists the proper degree of stiffness, if I may use the word, to produce the necessary rapidity of oscillation. But whatever may be said in regard to this supposition, it is evident, in case reliable hot-air engines cannot be obtained, that the Daboll trumpet may be operated by a steam-engine, although at an increased cost of maintenance, but this increase we think will still not be in proportion to the sound obtained in comparison with the whistle.

Another question which naturally arises, but which has not yet been definitely settled by experment, is whether both the siren and the whistle would not, equally with the trumpet, give more efficient results when worked by condensed air than by steam.

From hypothetical considerations this would appear to be the case, since the intensity of sound depends upon the density of the medium in which it is produced; and as the steam is considerably lighter than air, and as the cavities of all of these instruments are largely filled with steam, the intensity of sound would, on this account, seem to be less than if filled with air.

At the conclusion of the experiments at Sandy Hook, the siren was adopted as a fog-signal, in addition to the reed-trumpet and the locomotive-whistle, to be applied to the more important stations, while large bells were retained for points at which fog-signals were required to be heard at but comparatively small distances. These instruments of the first class being adopted, it became of importance to determine, in actual practice, the cost of maintenance, the best method of working them, and any other facts which might have a bearing on their use.

But as investigations of this kind would require much time and peculiar advantages as to location and mechanical appliances, this matter was referred to General Duane, the engineer in charge of the 1st and 2d light-house districts, who had peculiar facilities near his residence, at Portland, Me., in the way of workshops and other conveniences, and who, from his established reputation for ingenuity and practical skill

in mechanism, was well qualified for the work. The assignment of this duty to General Duane by the Light-House Board was made during my absence in Europe, in 1870, and as my vacation in 1871 was devoted to light-house duty in California, I had no opportunity of conferring with him on the subject until after his experiments were completed. His results are therefore entirely independent of those obtained under my direction, and I give them herewith in his own words, with such comments as they may suggest and as are necessary to a proper elucidation of the subject.

Experiments at Portland, Me. 1871, by General Duane.

The apparatus employed consisted of the first-class siren, first-class Daboll trumpet and steam-whistles of various sizes.

The points to be decided were:

1st. The relative power of these machines; *i. e.*, the distances at which they could be heard under various conditions of the atmosphere.

2d. The amount of fuel and water consumed by each.

3d. The attention and skill required in operating them.

4th. Their endurance.

5th. Whether they are sufficiently simple in construction to permit of their being managed and kept in running order by the class of men usually appointed light-house keepers.

In conducting these experiments the following method was pursued:

The signals were sounded at alternate minutes, and their sound compared at distances of two, three, and four miles, and from different directions. On every occasion the quantity of fuel and water consumed per hour by each was carefully noted, and the condition of each machine examined, both before and after the trial, to ascertain whether any of its parts had sustained injury.

Before giving the results of these experiments some facts should be stated, which will explain the difficulty of determining the power of a fog-signal.

There are six steam fog-whistles on the coast of Maine; these have been frequently heard at a distance of twenty miles, and as frequently cannot be heard at the distance of two miles, and this with no perceptible difference in the state of the atmosphere.

The signal is often heard at a great distance in one direction, while in another it will be scarcely audible at the distance of a mile. This is not the effect of wind, as the signal is frequently heard much farther against the wind than with it. For example, the whistle on Cape Elizabeth can always be distinctly heard in Portland, a distance of nine miles, during a heavy northeast snow-storm, the wind blowing a gale directly from Portland toward the whistle.

[In this sentence, General Duane certainly does not intend to convey the idea that a signal is frequently heard "at a much greater distance against the wind than with it," since this assertion would be at variance with the general experience of mankind; but the word "frequently" applies to the whistle on Cape Elizabeth, which has been already mentioned as a remarkably exceptional case, in which the sound is heard best against the wind during a northeast snow-storm.]

The most perplexing difficulty, however, arises from the fact that the signal often appears to be surrounded by a belt, varying in radius from one to one and a half miles, from which the sound appears to be entirely absent. Thus, in moving directly from a station, the sound is audible for the distance of a mile, is then lost for about the same distance, after which it is again distinctly heard for a long time. This action is common to all ear-signals, and has been at times observed at all the stations, at one of which the signal is situated on a bare rock twenty miles from the main-land, with no surrounding objects to affect the sound.

All attempts to re-enforce the sound by means of reflectors have hitherto been unsuccessful. Upon a large scale, sound does not appear, on striking a surface, to be reflected after the manner of light and heat, but to roll along it like a cloud of smoke.

[This statement is in a measure in accordance with results which I have previously found in connection with investigations at the light-house near New Haven, in which the conclusion was arrived at, that although rays of feeble sounds, and for a short distance, observe the law that the angle of reflection is equal to the angle of incidence after the manner of light, yet powerful sounds tend to diverge laterally to such a degree as to render reflectors of comparatively little use.]

In view of these circumstances, it will be obvious that it was extremely difficult to determine the extent of the power of the various signals under examination.

It should be remembered that while the sound from the whistle is equally distributed in all directions,* that from the two other signals, both of which are provided with trumpets, is not so distributed.

[The difference is apparent near by, but, as we have seen before, on account of the tendency of sound to spread it is imperceptible at a distance.]

In the siren the sound is most distinct in the axis of the trumpet.

In the Daboll trumpet it is usually strongest in a plane perpendicular to this axis.

[This is at variance directly with any observation I have myself made.]

Relative power.—From the average of a great number of experiments the following result was obtained:

The power of the first-class siren, 12″ whistle, and first-class Daboll trumpet, may be expressed by the numbers 9, 7, 4.

The extreme limit of sound of the siren was not ascertained. That of the 12″ whistle is about twenty miles, and of the trumpet twelve.

Consumption of fuel and water.—The siren, when working with a pressure of 72 pounds of steam, consumes about 180 pounds of coal and 126 gallons of water per hour.

The 12″ whistle, with 55 pounds pressure of steam, consumes 60 pounds of coal and 40 gallons of water per hour.

The Daboll trumpet, with 10 pounds pressure of air in the tank, consumes about 20 pounds of coal per hour.

The relative expenditure of fuel would be: siren, 9; whistle, 3; trumpet, 1.

The siren.—Of the three machines this is the most complicated. It uses steam at a high pressure, and some of its parts move with very great velocity, the siren spindle making from 1,800 to 2,400 revolutions per minute. The boiler must be driven to its full capacity in order to furnish sufficient steam. A large quantity of steam is, at intervals, suddenly drawn from the boiler, causing a tendency to foam, and to eject a considerable amount of water through the trumpet.

The constant attention of the keeper is required to regulate the fire, the supply of water to the boiler, of oil to the journals, &c.

In general terms, it may be stated that the siren requires more skill and attention in its management than either of the other signals.

The Daboll trumpet.—As the caloric engine, which has been hitherto employed to operate this signal, requires little fuel, no water, and is perfectly safe as regards danger from explosion, it would, at the first glance, appear to be the most suitable power that could be applied to fog-signals, and was accordingly at first exclusively adopted for this purpose. It was however found to be so liable to accident and so difficult to repair that of late years it has been almost entirely rejected. In the steam-boiler the furnace is surrounded by water, and it is impossible, under ordinary circumstances, to heat the metal much above the temperature of the water. The furnace of the caloric engine is surrounded by air, and is therefore liable to be burned out if the fire is not properly regulated.

The working-piston is packed with leather, and as it moves horizontally, with its whole weight resting on the lower side of the cylinder, the packing at its lower edge is soon worn out.

If the engine is allowed to stop with the piston at the furnace-end of the cylinder,

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*The sound of the whistle is equally distributed horizontally. It is, however, much stronger in the plane containing the lower edge of the bell than on either side of this plane. Thus, if the whistle is standing upright, in the ordinary position, its sound is more distinct in a horizontal plane passing through the whistle than above or below it.

the leather is destroyed by the heat. The repacking of a piston is a difficult and expensive operation, requiring more skill than can be expected among the class of men from whom light-house keepers are appointed.

Another accident to which these engines are subject arises from a sudden check in the velocity of the piston, caused either by the jamming of the leather packing or the introduction of dirt into the open end of the cylinder, in which case the momentum of the heavy, eccentrically-loaded fly-wheel is almost sure to break the main rocker-shaft.

The expense of repairs is considerably increased by the fact that these engines are not now in general use, and when important repairs are required it is usually necessary to send to the manufacturer.

This signal requires much attention. The fires must be carefully regulated to avoid burning out the furnace, the journals thoroughly oiled, and the cylinders well supplied with tallow.

The steam-whistle.—This machine requiring much less steam than the siren in proportion to the size of its boiler, there is not the same necessity for forcing the fire; the pressure of steam required is less, and the point from which it is drawn much higher above the water-level in the boiler, and there is consequently no tendency to foam.

The machinery is simple; the piston pressure very light, producing but little strain on the different parts of the engine, which is therefore not liable to get out of order and requires no more attention than a common stationary engine.

One marked advantage possessed by this signal is that should the engine become disabled, the whistle may still be sounded by working the valve by hand. This is not the case with the two others, where an accident to any part of the machinery renders the signal for the time useless.

It will thus be seen that the siren is the most expensive of the fog-signals as regards maintenance, and that it is adapted only to such stations as are abundantly supplied with water and situated in the vicinity of machine-shops where the necessary repairs can be promptly made.

On the other hand, as it is the most powerful signal. there are certain stations where it should have the preference; as, for example, Sandy Hook, which from its importance demands the best signal that can be procured, regardless of cost. Such stations should be provided with duplicate apparatus, well supplied with spare parts, to guard against any possibility of accident.

There should be a keeper whose sole business must be to attend the signal, and who should have sufficient mechanical skill to make the ordinary repairs. He should moreover be a licensed engineer.

There will also be required an assistant, who may be one of the light-keepers, to relieve him during the continuance of foggy weather.

The steam-whistle is the simplest in construction, most easily managed and kept in repair, and requires the least attention of all the fog-signals. It is sufficiently powerful for most localities, while its consumption of fuel and water is moderate.

It has been found on this coast that a sufficient quantity of rain-water can be collected to supply the 12″ whistle at nearly every station. This has been the case for the last two years at Martinicus.

The Daboll trumpet, operated by a caloric engine, should only be employed in exceptional cases, such as at stations where no water can be procured, and where, from the proximity of other signals, it may be necessary to vary the nature of the sound.

The trumpet however may undoubtedly be very much improved by employing steam power for condensing the air. The amount of work required, which is that of compressing 70 cubic feet of air to an average pressure of 8 pounds per inch, would be less than two-horse power. For this purpose the expenditure of fuel and water would be moderate; indeed, the exhaust steam could be condensed and returned to the cistern, should the supply of water be limited.

The siren also is susceptible of improvement, especially as regards simplification.

[In the foregoing remarks we think the general has expressed a somewhat undue partiality for the whistle, and somewhat overestimated the defects of the other instruments. The trumpets, with Ericsson engine, have not been abandoned, except partially in the two districts under the direction of General Duane, to which he probably intended to confine his statement. They are still in use in the third district, where they are preferred by General Woodruff, who finds no difficulty in keeping them in repair, having employed a skilled machinist who has made these instruments his special study, and who, visiting them from time to time, makes repairs and supplies new parts.]

The intermittent action of fog-signals makes it necessary to employ a peculiar form of boiler. The steam used is at a high pressure, and drawn off at intervals; consequently there is a tendency to foam and throw out water with the steam. To obviate this difficulty the form of boiler found by experience to be best adapted to this service is a horizontal tubular boiler (locomotive), with rather more than one-half of the interior space allowed for steam-room. The steam-dome is very large, and is surmounted by a steam pipe 12″ in diameter. Both the dome and pipe were formerly made much smaller, but were gradually enlarged as long as any difficulty with regard to foaming was noticed. The steam is drawn off at a point 10″ above the water-level in the boiler. The main points to be observed are to have plenty of steam-room, and to draw the steam from a point high above the water-level. It will be readily perceived that a vertical tubular boiler is entirely unsuited to this work.

It is essential, both as regards economy of fuel and the efficient working of the signal, that the boiler, including the dome and stand-pipe, should be well covered with some good non-conductor of heat. A material, called salamander felting, manufactured in Troy, N. Y., was used on the fog-whistle boiler at House Island during the winter of 1870. There resulted a saving of more than 20 per cent. of fuel over that consumed in the same boiler when uncovered. Where this material cannot be procured, a thick layer of hair felting, covered with canvas, will be found to answer a good purpose.

Various expedients have been proposed with the view of keeping the water in the boilers hot when the signals are not in operation, that the signal may always be ready to sound at a very short notice, and that the water in the boiler and pipes may be prevented from freezing in extremely cold weather. One of these contrivances is "Sutton's circulating water-heater." It consists essentially of a small, vertical, tubular boiler, entirely filled with water, and connected with the boiler or tank which contains the water to be heated, by two pipes on different levels. As soon as the water in the heater is warmed, a circulation commences, the hot water flowing through the upper pipe into the boiler, and the cold through the lower pipe from the boiler to the heater. As the furnace in the heater is very small but little fuel is consumed, and nearly the entire heat produced by the combustion is utilized.

The apparatus has been extensively employed in heating the water in tanks designed for filling the steam fire-engine boilers, when the alarm of fire is first given, and appears admirably adapted to this purpose. If used in connection with a steam-boiler, it should be disconnected before steam is raised in the latter, as, from its construction, it is not calculated to withstand any considerable pressure.

An arrangement, similar in principle, has been used in the first light-house district, consisting of a small cylinder coal-stove, of the ordinary pattern, around the interior of which, and above the grate, is introduced a single coil of $\frac{3}{4}''$ pipe. This coil is connected with the boiler by two pipes, one entering near the bottom, the other about 2 feet higher. It has been found that in consequence of the rapid circulation of the water through this coil, and the great capacity of water for heat, that nearly all the heat from the fire in the stove is transferred to the water in the boiler. This arrangement possesses the advantage of the $\frac{3}{4}''$ pipe, being strong enough to stand any pressure that can be used in the boiler, rendering it unnecessary to disconnect it at any time.

Experience has, however, proved that none of these contrivances are essential. It is seldom that an attentive keeper cannot foresee the approach of fog or snow in time to have the apparatus in operation as soon as required, even when obliged to start his fire with cold water in the boiler.

Keepers should be directed to watch the state of the weather carefully, and to light their fires at the first indication of fog or snow-storm. As soon as the water in the boiler is near the boiling point, should the necessity for sounding the signal have not yet arisen, the fire may be banked, and in this state the water may be kept hot for any length of time at a moderate expenditure of fuel. With proper care, no more fuel is required to keep the water at the requisite temperature by means of a banked fire than by any other method, and it is a matter of great importance to avoid complicating fog-signal apparatus by unnecessary appendages.

The same plan should be adopted in extremely cold weather to prevent the water in the boiler from freezing. There should be a small air-cock in the draught-pipe near its junction with the feed pump, and in cold weather this should be opened when the pump is not in use, in order to allow the pipe to empty itself.

When the draught-pipe cannot be protected from the cold, and the well is at a considerable distance from the engine, the following expedient has been employed with success: The pipe is inclosed in an India-rubber hose of about double its diameter, and from time to time steam is forced through the space between the hose and draught-pipe by means of a small pipe from the boiler.

Although the laws governing the reflection of light and heat are undoubtedly, in a great measure, applicable to sound, there are yet so many disturbing influences, such as inflection, refraction, caused by the varying density of the atmosphere, &c., interfering with the reflection of the latter, that but little use can be made of this property in

directing and condensing the waves of sound issuing from a fog-signal. This fact may be illustrated by an account of some experiments made during the last year.

A whistle being sounded in the focus of a large parabolic reflector, it was very perceptible to an observer in the immediate vicinity that the sound was louder in the front than in the rear of the reflector. As the distance of the observer from the whistle was increased this disparity rapidly diminished, and at the distance of a few hundred yards entirely disappeared. The *beam* of sound had been dissipated and the *shadow* had vanished. The effect of a horizontal sounding-board 10 feet square, suspended over the whistle to prevent the escape of sound in a vertical direction, was inappreciable at the distance of a quarter of a mile.

The employment of a trumpet with the whistle was rather more successful. The trumpet was constructed of wood, in the form of a square pyramid; the lower base being 10′ by 10′, the upper base 2′ by 2′, and the height 20′. The axis was horizontal and the whistle placed at the smaller end. By this arrangement the increased power of the sound could be perceived at the distance of a mile, the action being similar to that of a speaking-trumpet.

It is probable that some modification of this form of whistle may be advantageously employed in certain localities, but there is however a disadvantage attending the use of a trumpet with fog-signals.

The sound from a trumpet not being uniformly distributed, it is difficult to estimate the distance of the signal, or, as the pilots term it, "to locate the sound." This has been observed in the siren and Daboll trumpet. The sound from these signals being stronger on one course than any other, may be distinctly heard from a vessel when crossing the axis of the beam of sound, but as its distance from this line increases, the sound appears fainter and more remote, although the vessel may be approaching the signal.

From an attentive observation, during three years, of the fog-signals on this coast, and from the reports received from captains and pilots of coasting vessels, I am convinced that in some conditions of the atmosphere the most powerful signals will be at times unreliable.

Now it frequently occurs that a signal, which under ordinary circumstances would be audible at the distance of fifteen miles, cannot be heard from a vessel at the distance of a single mile. This is probably due to the reflection mentioned by Humboldt.

The temperature of the air over the land where the fog-signal is located, being very different from that over the sea, the sound, in passing from the former to the latter, undergoes reflection at their surface of contact. The correctness of this view is rendered more probable by the fact that when the sound is thus impeded in the direction of the sea, it has been observed to be much stronger inland.

When a vessel approaches a signal in a fog, a difficulty is sometimes experienced in determining the position of the signal by the direction from which the sound appears to proceed, the apparent and true direction being entirely different. This is undoubtedly due to the refraction of sound passing through media of different density.

Experiments and observation lead to the conclusion that these anomalies in the penetration and direction of sound from fog-signals are to be attributed mainly to the want of uniformity in the surrounding atmosphere, and that snow, rain, fog, and the force and direction of the wind, have much less influence than has generally been supposed.

[In the foregoing I differ entirely in opinion from General Duane as to the cause of extinction of powerful sounds being due to the unequal density of the atmosphere. The velocity of sound is not at all affected by barometric pressure, but if the difference in pressure is caused by a difference in heat, or by the expansive power of vapor mingled with the air, a slight degree of obstruction of sounds may be observed. But this effect we think is entirely too minute to produce the results noted by General Duane, while we shall find in the action of the currents of wind above and below, a true and sufficient cause.]

The experimental whistles were of the following dimensions, viz: 2½″, 3″, 4″, 5″, 6″, 10″, 12″, and 18″ in diameter. Those of 2½″, 3″, 5″, and 10″ were fitted, instead of the ordinary bell, with long cylinders, provided with movable pistons, so that the effective length of the bell could be altered at pleasure. The pitch of the blast was found to vary with the length of the bell, and the power of the whistle with its diameter. The ratio of the power to the diameter was not accurately obtained, but it is probable that the extreme range of sound of a whistle is proportional to the square root of its diameter.

[This result, that the pitch varies with the length of the bell, is in conformity with well-established principles of resounding cavities; and that the power should increase with the extent of the aerial reed, the vibrations of which give motion to the resounding air within the cavity, is also, as we have seen, in accordance with hypothetical considerations; but as the density of this stream of steam, and consequently the rapidity of its vibrations, depends upon the pressure of the steam in the boiler, a perfect whistle should have the capability of changing its dimensions, not only in relation to the width of its throat, but also in regard to the pressure of the steam in the reservoir.]

The pitch giving the greatest range appears to be at the middle of the scale of sound. It is certain that a good result cannot be obtained from either a very shrill or a bass note. This remark is applicable to all varieties of signal.

The 10″ and 12″ whistles are recommended for ordinary use. The 18″ whistle is more powerful, but the increase of power bears too small a proportion to that of the expenditure of fuel to render its employment generally advisable. The best results were obtained by giving the whistle the following proportions: The diameter of the bell equaling two-thirds of its length, and the set of the bell, *i. e.*, the vertical distance of the lower edge above the cup, the one-third to one-fourth of the diameter for a pressure of 50 to 60 pounds of steam

A bell, whether operated by hand or by machinery, cannot be considered an efficient fog-signal on the sea-coast. In calm weather it cannot be heard half the time at a greater distance than one mile, while in rough weather the noise of the surf will drown its sound to seaward altogether.

On approaching a station I have frequently seen the bell rung violently by the keeper, without being able to hear the sound until I had landed.

Nevertheless, all important stations should be provided with bells, as there are occasions when they may serve a useful purpose, but it should be well understood by mariners that they must not expect always to hear the bells as a matter of course.

Bells should not be omitted at stations furnished with steam fog-signals, especially when the latter are not in duplicate, and mariners should be warned that the bell will be sounded when the regular signal is disabled.

It has been observed that a bell rung by hand can be heard further than when sounded by machinery, and many of the steamboat companies on this coast pay the keepers of bells rung by clock-work to ring them by hand when the boats of their line are expected to pass.

[We think the difference in the effect of ringing of bells by hand or by machinery is so slight as to be inappreciable except at a short distance. It is true, as I have before observed, that the sound is louder when the mouth of the bell is directed toward the hearer than when the edge is so directed, but on account of the spreading of this sound the effect is lost in a small distance, and indeed in one light-house the bell is permanently placed with the axis of its mouth directed horizontally, and in this position, if the bell were struck interiorly with a hammer, which would give it a larger vibration than when struck exteriorly, I doubt whether any difference would be observed between the two methods of ringing; and if any existed it would probably be in favor of the fixed bell rung by machinery.]

On rivers, narrow channels, and lakes, where the difficulty from the noise of the surf does not exist, this species of signal may be used to advantage, as its maintenance requires but a small expenditure of either money or labor, and by a proper arrangement of the machinery the intervals between the strokes of the bell may be so regulated as to avoid the danger of confounding the signals, however near together.

Although a bell may be heard better when sounded by hand than by clock-work, yet in thoroughfares where the signal must be kept in constant operation during the entire continuance of a fog, it would be impracticable to make use of the former method, and recourse must be had to machinery.

In arranging the signal the bell and machinery must be placed as low as possible, as the sound is heard much more plainly on the water when the bell is near its surface, and also as the machinery, when thus situated, is steadier and more readily accessible.

Particulars as to the siren.—The boiler of a second-class apparatus is 12 feet long, 42 inches in diameter, and has 300 feet heating-surface. The dome is 2 feet in diameter and 3 feet high.

The cylinder of the engine is 4 inches in diameter and 6 inches stroke. The prolongation of the piston-rod forms the plunger of the feed-pump. The main shaft carries three pulleys, the larger driving the siren-spindle; the second, the worm and screw gear; and the third, the governor.

In the worm-gear the wheel makes two revolutions per minute, and is provided with a cam, which, acting on a lever, opens the valve, admitting steam through the siren-disks. The cam has such a length as to hold the valve open for about seven seconds. A counter-weight closes the valve as soon as the lever is released by the cam.

The siren itself consists of a cylindrical steam-chest, closed at one end by a perforated brass plate. The perforations are twelve in number, equidistant from each other, and arranged on the circumference of a circle, whose center is in the axis of the cylinder. The other end is closed by a cast-iron head. The heads are connected by a brass pipe, through which the spindle passes.

The perforated head is covered on the exterior by a brass disk, attached to the spindle, having twelve rectangular notches corresponding to the apertures on the former, and so arranged that by its revolution these apertures are simultaneously opened and closed. The spindle is driven by a belt from the large pulley on the main shaft. This shaft makes 180 revolutions per minute; the spindle, 1,620; and as there are 12 apertures in the disks, from each there will issue jets of steam at the rate of 19,440 per minute. The sound produced by these impulses may be rendered more or less acute by increasing or diminishing the velocity of revolution.

The valve and valve-seat are disks similar to those already described, having however four openings instead of twelve. The valve revolves on the brass tube inclosing the siren-spindle, and is worked by a bevel gear. The trumpet is of cast-iron.

The Daboll trumpet.—The apparatus used in the foregoing experiments is a second-class trumpet, operated by an Ericsson caloric-engine. The air-pump is single-acting. Its cylinder is 12″ in diameter by 12″ stroke. The engine makes forty strokes per minute. There is a screw-thread raised on the main shaft, which, acting on a wheel, drives a bevel gear, giving motion to a cam-wheel. The latter makes one revolution in two minutes, and is furnished with three equidistant cams. These cams, pressing on the valve-lever, throw the valve open once in forty seconds, admitting the compressed air through the reed-chest into the trumpet.

The quantity of air forced into the tank should be in excess of that needed for the trumpet, the surplus being allowed to escape through a delicate safety-valve. This is necessary to provide against a deficiency in case of leakage, and also to allow the pressure of air to be regulated to accommodate the reed. Each reed requiring a different pressure, it is necessary to alter the pressure of the valve-spring whenever a reed is changed.

The first-class trumpet differs only in size from that described.

The caloric-engine for the first class has a 30″ cylinder. The air-pump is 16½″ by 15″ stroke.

The steam-whistle.—The boiler of this machine is that of the siren. On the forward part of the boiler the bed-plate of a small engine is secured by two cast-iron brackets. The cylinder of this engine is 4″ by 9″. The fly-wheel shaft carries an eccentric, which, acting through a rod and pawl on a ratchet-wheel, gives the required motion to the cam-wheel shaft.

The cam-wheel, which makes one revolution per minute, is provided with one or more cams, depending on the number of blasts to be given in a minute; the length of the blast being regulated by that of the cams.

The valve for admitting the steam into the whistle is a balance-valve, the diameters of the two disks being respectively 3¼″ and 2⅞″, which difference is sufficient to cause the pressure of steam to close the valve tight without requiring too great a force to open it. The valve is worked by a stem attached to the rocker-shaft at the lower part of the steam-pipe. This shaft passes through a stuffing-box in the steam-pipe, and is provided with a collar which the pressure of the steam forces against the interior boss on the pipe, thus making the joint steam-tight. The exterior arm on this rocker-shaft, as well as that on the engine, is perforated in such a manner as to allow the throw of the valve to be adjusted.

In the comments we have made on the report of General Duane, the intention was not in the least to disparage the value of his results, which can scarcely be too highly appreciated; but inasmuch as the true explanation of the phenomena he has observed has an important bearing on the location of fog-signals and on their general application as aids to navigation, and are as well of great interest to the physicist, who values every addition to theoretical as well as practical knowledge, we have not only thought the remarks we have offered necessary, but also that special investigations should be made to ascertain more definitely the conditions under which the abnormal phenomena the general has described occur, and to assign, if possible, a more definite and efficient cause than those to which he has attributed them.

We have, therefore, given much thought to the subject, and since the date of General Duane's report, have embraced every opportunity which occurred for making observations in regard to them. The first step we made toward obtaining a clew to the explanation of the phenomena in question resulted from observations at New Haven, namely: 1st, the tendency of sound to spread laterally into its shadow; 2d, the fact that a sound is frequently borne in an opposite direction to the wind at the surface by an upper current; and 3d, that a sound moving against a wind is heard better at a higher elevation. The first point to consider is in what manner the wind affects sound. That it is in some way connected with the distance to which sound can be heard is incontestably settled by general observation. At first sight, the explanation of this might seem to be very simple, namely, that the sound is borne on in the one direction and retarded in the other by the motion of the wind. But this explanation, satisfactory as it might appear, cannot be true. Sound moves at the rate of about 780 miles an hour, and therefore, on the above supposition, a wind of 7.8 miles per hour could neither retard nor accelerate its velocity more than one per cent., an amount inappreciable to ordinary observation; whereas we know that a wind of the velocity we have mentioned is frequently accompanied with a reduction of the penetrating power of sound of more than 50 per cent.

The explanation of this phenomenon, as suggested by the hypothesis of Professor Stokes, is founded on the fact that in the case of a deep current of air the lower stratum, or that next the earth, is more retarded by friction than the one immediately above, and this again than the one above it, and so on. The effect of this diminution of velocity as we descend toward the earth is, in the case of sound moving with the current, to carry the upper part of the sound-waves more rapidly forward than the lower parts, thus causing them to incline toward the earth, or, in other words, to be thrown down upon the ear of the observer. When the sound is in a contrary direction to the current, an opposite effect is produced,—the upper portion of the sound-waves is more retarded than the lower, which advancing more rapidly, in consequence inclines the waves upward and directs them above the head of the observer. To render this more clear,

let us recall the nature of a beam of sound, in still air, projected in a horizontal direction. It consists of a series of concentric waves perpendicular to the direction of the beam, like the palings of a fence. Now, if the upper part of the waves has a slightly greater velocity than the lower, the beam will be bent downward in a manner somewhat analogous to that of a ray of light in proceeding from a rarer to a denser medium. The effect of this deformation of the wave will be cumulative from the sound-center onward, and hence, although the velocity of the wind may have no perceptible effect on the velocity of sound, yet this bending of the wave being continuous throughout its entire course, a marked effect must be produced.

A precisely similar effect will be the result, but perhaps in a considerably greater degree, in case an upper current is moving in an opposite direction to the lower, when the latter is adverse to the sound, and in this we have a logical explanation of the phenomenon observed by General Duane, in which a fog-signal is only heard during the occurrence of a northeast snow-storm. Certainly this phenomenon cannot be explained by any peculiarity of the atmosphere as to variability of density, or of the amount of vapor which it may contain.

The first phenomenon of the class mentioned by General Duane, which I had the good fortune to witness was in company with Sir Frederick Arrow and Captain Webb, of the Trinity House, London, in their visit to this country in 1872. At the distance of two or three miles from an island in the harbor of Portland, Maine, on which a fog-signal was placed, the sound, which had been distinctly heard, was lost on approaching the island for nearly a mile, and slightly regained at a less distance. On examining the position of the fog-signal, which was situated on the farther side of the island from the steamer, we found it placed immediately in front of a large house with rising ground in the rear, which caused a sound-shadow, into which, on account of the lateral divergence of the rays, the sound was projected at a distance, but not in the immediate vicinity of the island. In the same year I made an excursion in one of the light-house steamers, with Captain Selfridge, to an island on the coast of Maine, at which abnormal phenomena were said to have been observed, but on this occasion no variation of the sound was noted, except that which was directly attributable to the wind, the signal being heard much farther in one direction than in the opposite.

PART II.—REMARKS ON SOME ABNORMAL PHENOMENA OF SOUND.*

The communication which I propose to make this evening is brought forward at this time especially on account of the presence of Dr. Tyndall, he being connected with the light-house system of Great Britain, while the facts I have to state are connected with the light-house service of the United States, and must therefore be of interest to our distinguished visitor. The facts I have to present form part of a general report to be published by the United States Light-House Board.

The Light-House Board of the United States has from its first establishment aimed not only to furnish our sea-coast with all the aids to navigation that have been suggested by the experience of other countries and to adopt the latest improvements, but also to enrich the light-house service with the results of new investigations and new devices for the improvement of its efficiency, or, in other words, to add its share to the advance of a system which pertains to the wants of the highest civilization.

Among the obstructions to navigation none are more serious, especially on the American coast, than those caused by fogs.

Fog, as it is well known, is due to the mingling of warmer air surcharged with moisture with colder air, and nowhere on the surface of the earth do more favorable conditions exist for producing fogs than on both our Atlantic and Pacific coasts. On the Atlantic the cold stream of water from the polar regions in its passage southward, on account of the rotation of the earth, passes close along our eastern coast from one extremity to the other, and parallel to this but opposite in direction, for a considerable distance is the great current of warm water known as the Gulf Stream. Above the latter the air is constantly surcharged with moisture, and consequently whenever light winds blow from the latter across the former, the vapor is condensed into fog, and since in summer along our eastern coast the southerly wind prevails, we have during July, August, and September, especially on the coast of Maine, an almost continuous prevalence of fogs so dense that distant vision is entirely obstructed.

On the western coast the great current of the Pacific, after having been cooled in the northern regions, in its passage southward gives rise to cold and warm water in juxtaposition, or, in other words, a current of the former through the latter, and hence whenever a wind blows across the current of cold water, a fog is produced.

From the foregoing statement it is evident that among the aids to navigation fog-signals are almost as important as light-houses. The application however of the science of acoustics to the former is far less advanced than is that of optics to the latter. Indeed, attempts have been made to apply lights of superior penetrating power, as the electric

* Made before the "Philosophical Society of Washington," December 11, 1872.

and calcium lights, to supersede the imperfect fog-signals in use. When however we consider the fact that the absorptive power of a stratum of cloud, which is but a lighter fog, of not more than two or three miles in thickness, is sufficient to obscure the image of the sun, the intensity of the light of which is greater than that of any artificial light, it must be evident that optical means are insufficient for obviating the difficulty in question.

The great extent of the portions of the coast of the United States which are subject to fogs renders the investigation of the subject of fog-signals one of the most important duties of the Light-House Board.

In studying this subject it becomes a question of importance to ascertain whether waves of sound, like those of light, are absorbed or stifled by fog; on this point however, observers disagree. At first sight, from the very striking analogy which exists in many respects between light and sound, the opinion has largely prevailed that sound is impeded by fog. But those who have not been influenced by this analogy have in some instances adopted the opposite opinion—that sound is better heard during a fog than in clear weather. To settle this question definitely the Light-House Board have directed that at two light-houses on the route from Boston to Saint John the fog-signals shall be sounded every day on which the steamboats from these ports pass the station, both in clear and foggy weather, the pilots on board these vessels having, for a small gratuity, engaged to note the actual distance of the boat when the sound is first heard on approaching the signal and is last heard on receding from it. The boats above mentioned estimate their distance with considerable precision by the number of revolutions of the paddle-wheel as recorded by the indicator of the engine, and it is hoped by this means to definitely decide the point in question. We think it probable that fog does somewhat diminish the penetrating power of sound, or in other words, produce an effect analogous to that on the propagation of light. But when we consider the extreme minuteness of the particles of water constituting the fog as compared with the magnitude of the waves of sound, the analogy does not hold except in so small a degree as to be of no practical importance, or, in other words, the existence of a fog is a true, but, we think, a wholly insufficient cause of diminution of sound, which view is borne out by the great distance at which our signals are heard during a dense fog.

Another cause, which without doubt is a true one, of the diminution of the penetrating power of sound is the varying density of the atmosphere, from heat and moisture, in long distances. The effect of this, however, would apparently be to slightly distort the wave of sound rather than to obliterate it. However this may be, we think, from all the observations we have made, the effect is small in comparison with another cause, viz, that of the influence of wind. During a residence of several weeks at the sea-shore, the variation in intensity of the sound

of the breakers at a distance of about a mile in no case appeared to be coincident with the variations of an aneroid barometer or a thermometer, but in every instance it was affected by the direction of the wind.

The variation in the distinctness of the sound of a distant instrument as depending on the direction of the wind is so marked that we are warranted in considering it the principal cause of the inefficiency in certain cases of the most powerful fog-signals. The effect of the wind is usually attributed, without due consideration, to the motion of the body of air between the hearer and the sounding instrument; in the case of its coming towards him it is supposed that the velocity of the sound is reinforced by the motion of the air, and when in the opposite direction that it is retarded in an equal degree. A little reflection, however, will show that this cannot be the cause of the phenomenon in question, since the velocity of sound is so vastly greater than that of any ordinary wind that the latter can only impede the progress of the former by a very small percentage of the whole. Professor Stokes, of Cambridge University, England, has offered a very ingenious hypothetical explanation of wind on sound, which we think has an important practical bearing, especially in directing the line of research and subsequent application of principles.

His explanation rests upon the fact that during the passage of a wind between the observer and the sounding instrument the velocity of this will be more retarded at the surface of the earth on account of friction and other obstacles, and that the velocity of the stratum immediately above will be retarded by that below, and so on, the obstruction being lessened as we ascend through the strata. From this it follows that the sound wave will be deformed and the direction of its *normal* changed. Suppose, for example, that the wind is blowing directly from the observer. In this case the retardation of the sound wave will be greater above than below, and the upper part of the wave-front will be thrown backwards so that the axis of the phonic ray will be deflected upwards, and over the head of the observer. If, on the other hand, a deep river of wind (so to speak) is blowing directly towards the observer, the upper part of the front of the wave will be inclined down and towards him, concentrating the sound along the surface of the earth.

The science of acoustics in regard to the phenomena of sound as exhibited in limited spaces has been developed with signal success. The laws of its production, propagation, reflection, and refraction have been determined with much precision, so that we are enabled in most cases to explain, predict, and control the phenomena exhibited under given conditions. But in case of loud sounds and those which are propagated to a great distance, such as are to be employed as fog-signals, considerable obscurity still exists. As an illustration of this I may mention the frequent occurrence of apparently abnormal phenomena. General Warren informs me that at the battle of Seven Pines, in June, 1862, near Richmond,—General Johnston, of the Confederate army, was within three

miles of the scene of action with a force intended to attack the flank of the Northern forces, and although listening attentively for the sound of the commencement of the engagement, the battle, which was a severe one, and lasting about three hours, ended without his having heard a single gun. (See Johnston's report.) Another case of a similar kind occurred to General McClellan at the battle of Gaines' Mills, June 27, 1862, also near Richmond. Although a sharp engagement was progressing within three or four miles for four or five hours, the general and his staff were unaware of its occurrence, and when their attention was called to some feeble sound they had no idea that it was from anything more than a skirmish of little importance. (See Report of the Committee on the Conduct of the War.) A third and perhaps still more remarkable instance is given in a skirmish between a part of the Second Corps under General Warren and a force of the enemy. In this case the sound of the firing was heard more distinctly at General Meade's headquarters than it was at the headquarters of the Second Corps itself, although the latter was about midway between the former and the point of conflict. Indeed the sound appeared so near General Meade's camp that the impression was made that the enemy had gotten between it and General Warren's command. In fact so many instances occurred of wrong impressions as to direction and distance derived from the sound of guns that little reliance came to be placed on these indications.

In the report of a series of experiments made under the direction of the Light-House Board by General Duane of the Engineer Corps is the following remark: "The most perplexing difficulty arises from the fact that the fog-signal often appears to be surrounded by a belt varying in radius from one to one and a half miles. Thus in moving directly from a station the sound is audible for the distance of a mile, is then lost for about the same distance, after which it is again distinctly heard for a long time."

Again, in a series of experiments at which Sir Frederick Arrow and Captain Webb, of the Trinity Board, assisted, it was found that in passing in the rear of the opposite side of an island in front of which a fog-signal was placed, the sound entirely disappeared, but by going further off to the distance of two or three miles it reappeared in full force, even with a large island intervening. Again, from the experiments made under the immediate direction of the present chairman of the Light-House Board, with the assistance of Admiral Powell and Mr. Lederle, the light-house engineer, and also from separate experiments made by General Duane, it appears that while a reflector, in the focus of which a steam whistle or ordinary bell is placed, reinforces the sound for a short distance, it produces little or no effect at the distance of two or three miles, and, indeed, the instrument can be as well heard in still air at the distance of four or five miles in the line of the axis of the reflector, whether the ear be placed before or behind it. From these results we would infer that the lateral divergency of sound, or its tendency to spread lat-

erally as it passes from its source, is much greater than has been supposed from experiments on a small scale. The idea we wish to convey by this is that a beam of sound issuing through an orifice, although at first proceeding like a beam of light in paralled rays, soon begins to diverge and spread out into a cone, and at a sufficient distance may include even the entire horizon.

We may mention also in this connection that from the general fact expressed by the divergence of the rays of sound, the application of reflection as a means of reinforcing sound must in a considerable degree of necessity be a failure.

By the application of the principle we have stated and the effect of the wind in connection with the peculiarities of the topography of a region and the position of the sounding body, we think that not only may most of the phenomena we have just mentioned be accounted for, but also that other abnormal effects may be anticipated.

In critically examining the position of the sounding body in the experiment we have mentioned, in which Sir Frederick Arrow and Captain Webb assisted, it was found that the signal was placed on the side of a bank with a large house directly in the rear, the roof of which tended to deflect the sound upwards so as to produce in the rear a shadow, but on account of the divergency of the beam this shadow vanished at the distance of a mile and a half or two miles, and at the distance of, say, three miles the sound of the instrument was distinctly heard. I doubt not that, on examination, all the cases mentioned by General Duane, with one exception, might be referred to the same principle, the exception being expressed in the following remarkable statement in his report to the Light-House Board: "The fog-signals have frequently been heard at a distance of *twenty* miles and as frequently cannot be heard at the distance of *two* miles, and with no perceptible difference in the state of the atmosphere. The signal is often heard at a greater distance in one direction, while in another it will be scarcely audible at the distance of a mile. For example, the whistle at Cape Elizabeth can always be distinctly heard in Portland—a distance of nine miles—during a heavy northeast snowstorm, the wind blowing a gale nearly from Portland towards the whistle."

This is so abnormal a case, and so contrary to generally received opinion, that I hesitated to have it published under the authority of the board until it could be verified and more thoroughly examined. In all the observations that have been made under my immediate supervision, the sound has always been heard farther *with* the wind than against it. It would appear, therefore, from all the observations that the normal effect of the wind is to diminish the sound in blowing directly against it.

There is however a meteorological condition of the atmosphere during a northeast storm on our coast which appears to me to have a direct bearing on the phenomenon in question. It is this: that while a violent wind is blowing from the northeast into the interior of the country, a wind of equal intensity is blowing in an opposite direction at an ele-

vation of a mile or two. This is shown by the rapid eastwardly motion of the upper clouds as occasionally seen through breaks in the lower.

As a further illustration of this principle I may mention that on one occasion (in 1855) I started, on my way to Boston from Albany, in the morning of a clear day, with a westerly wind. The weather continued clear and pleasant until after passing the Connecticut River, and until within fifty miles of Boston. We then encountered a storm of wind and rain which continued until we reached the city. On inquiry I learned that the storm had commenced in Boston the evening before, and, although the wind had been blowing violently towards Albany for *twenty* hours, it had not reached inwardly more than fifty miles. At this point it met the *west* wind and was turned back above in almost a parallel current. This is the general character of northeast storms along our coast, as shown by Mr. Espy, and is directly applicable to the phenomenon mentioned by General Duane, and which, from the frequency with which he has witnessed the occurrence, we must accept as a fact, though by no means a general one applicable to all stations. While a violent wind was blowing towards his place of observation from Cape Elizabeth, at the surface of the earth, a parallel current of air was flowing above with equal or greater velocity in the opposite direction. The effect of the latter would be to increase the velocity of the upper part of the wave of sound, and of the former to diminish it; the result of the two being to incline the front of the wave of sound towards the observer, or to throw it down towards the earth, thus rendering the distant signal audible under these conditions when otherwise it could not be heard. I think it is probable that the same principle applies in other cases to the abnormal propagation of sound.

For the production of a sound of sufficient power to serve as a fog-signal, bells, gongs, &c., are too feeble except in special cases where the warning required is to be heard only at a small distance. After much experience, the Light-House Board has adopted, for first-class signals, instruments actuated by steam or hot-air engines, and such only as depend upon the principle of resonance, or the enforcement of sound by a series of recurring echoes in resounding cavities.

Of these there are three varieties. First, the steam-whistle, of which the part called the bell is a resounding cavity, the sound it emits having no relation to the material of which it is composed; one of the same form and of equal size of wood producing an effect identical with that from one of metal. Another variety is the fog-trumpet, which consists of a trumpet of wood or metal actuated by a reed like that of a clarionet. The third variety is called the siren trumpet, which consists of a hollow drum, into one head of which is inserted a pipe from a steam-boiler, while in the other head a number of holes are pierced, which are alternately opened and shut by a revolving plate having an equal number of holes through it. This drum is placed at the mouth of a large trumpet. The sound is produced by the series of impulses given to the

air by the opening and shutting of the orifices and consequent rushing out at intervals with explosive violence of the steam or condensed air. The instrument, as originally invented by Cagniard de Latour, of France, was used simply in experiments in physics to determine the pitch of sound; but Mr. Brown, of New York, after adding a trumpet to it, and modifying the openings in the head of the drum and the revolving plate, offered it to the Light-House Board as a fog-signal, and as such it has been found the most powerful ever employed.

In ascertaining the penetrating power of different fog-signals, I have used with entire success an instrument of which the following is a description: A trumpet of ordinary tinned iron of about 3 feet in length, and 9 inches in diameter at the larger end, and about 1 inch at the smaller, is gradually bent so that the axis of the smaller part is at right angles to the axis of the larger end; on the smaller end is soldered a cone, of which the larger end is about 2 inches in diameter. Across the mouth of this cone is stretched a piece of gold-beater's skin. When the instrument is used, the opening on the larger end is held before the instrment to be tested, the membrane being horizontal, and the mouth of the trumpet vertical; over the membrane is strewed a small quantity of fine sand, which is defended from the agitation of the air by a cylinder of glass, the upper end of which is closed by a lens. When the instrument under examination is sounded, being sufficiently near the sand, is agitated; it is then moved further off, step by step, until the agitation just ceases; this distance, being measured, is taken as the relative penetrating power of the sounding instrument. The same process is repeated with another sounding instrument, and the distance at which the sound ceases to produce an effect on the sand is taken as the measure of the penetrating power of this instrument, and so on. On comparing the results given by this instrument with those obtained by the ear on going out a sufficient distance, the two are found to agree precisely in their indications. The great advantage in using this contrivance is that the relative penetrating power of two instruments may be obtained within a distance of a few hundred yards, while to compare the relative power of two fog-signals by the ear requires the aid of a steamer and a departure from the origin of sound in some cases of 15 or 20 miles.

PART III.—INVESTIGATIONS DURING 1873 AND 1874.*

Observations on Sound and Fog-Signals, in August, 1873.

Professor Henry, chairman, and Commander Walker, naval secretary of the Light-House Board, left Portland August 12th, 1873, at 3 o'clock P. M. in the steam-tender Myrtle, Captain Foster, for Whitehead light-station, at which place abnormal phenomena of sound had been observed.

* From the Report of the Light-House Board, for 1874.

Whitehead light-station is on a small island about a mile and a half from the coast of Maine, on the western side of the entrance to Penobscot Bay, and in the direct line of the coasting-steamers and other vessels from the westward bound into the Penobscot Bay and River. The light-house and fog-signal are situated on the southeast slope of the island, the surface of which consists almost entirely of rock, the middle being at an elevation of 75 feet above the mean tide-level.

The phenomena which had been observed at this and other stations along the coast consisted of great variation of intensity of sound while approaching and receding from the station. As an example of this we may state the experience of the observers on board the steamer City of Richmond on one occasion, during a thick fog in the night in 1872. The vessel was approaching Whitehead from the southwestward, when, at a distance of about six miles from the station, the fog-signal, which is a 10-inch steam-whistle, was distinctly perceived and continued to be heard with increasing intensity of sound until within about three miles, when the sound suddenly ceased to be heard, and was not perceived again until the vessel approached within a quarter of a mile of the station, although from conclusive evidence furnished by the keeper it was shown that the signal had been sounding during the whole time. The wind during this time was from the south, or approximately in an opposite direction to the sound. Another fact connected with this occurrence was that the keeper on the island distinctly heard the sound of the whistle of the steamer, which was commenced to be blown as soon as the whistle at the station ceased to be heard, in order to call the attention of the keeper to what was supposed to be a neglect of his duty in intermitting the operations of his signal. It should be observed in this case that the sound from the steamer was produced by a 6-inch whistle, while that of the station was from an instrument of the same kind of 10 inches in diameter; or, in other words, a lesser sound was heard from the steamer, while a sound of greater volume was unheard in an opposite direction from the station. It is evident that this result could not be due to any mottled condition or want of acoustic transparency of the atmosphere, since this would absorb the sound equally in both directions. The only plausible explanation of this phenomenon is that which refers it to the action of the wind. In the case of the sound from the steamer, the wind was favorable for its transmission, and hence it is not strange that its sound should be heard on the island when the sound from the other instrument could not be be heard on the steamer. To explain on the same principle the fact of the hearing of the sound at the distance of six miles, and afterward of losing it at the distance of three miles, we have only to suppose that in the first instance the retarding effect of the wind was small, and that in the second it became much greater on account of a sudden increase in the relative velocity of the current in the upper and lower portions.

After making a critical examination of the island and the position of

the machinery, and also in regard to any obstacle which might interfere with the propagation of the sound, the keeper was directed to put the instrument in operation and to continue to sound it for at least two hours, or until the steamer was lost sight of, which direction was complied with. In passing from the island, almost directly against a light wind, the intensity of the sound gradually diminished as a whole, with the increase of distance, but varied in loudness from blast to blast, now louder, then again more feeble, until it finally ceased at a distance of about fifteen miles, as estimated by the intervals between the blasts and the sight of the steam as seen through a spy-glass, and also from points on the Coast-Survey charts.

The result of this investigation clearly showed the power of the apparatus in propagating sound under conditions not entirely favorable, since the wind, though light, was in opposition to the sound.

Cape Elizabeth Light-Station, Maine, August 29, 1873.—The fog-signal at this place is on a prominent headland to which the course of all vessels is directed when bound from the southward into Portland Harbor. It is furnished with two light houses 919 feet apart and 143 feet above sea-level. The easterly tower is connected with the keeper's dwelling by a wooden-covered way 200 feet long and about 12 feet high; the station is furnished with a 10-inch steam fog-whistle, placed to the southward of the easterly tower, at a distance of about 625 feet and about at right angles with the covered way; it therefore has a background, including the covered way, of about 65 feet above the height of the whistle, which was found to reflect a perceptible echo. The whistle was actuated by steam at 55 pounds pressure, consuming from 60 to 65 pounds of anthracite coal per hour. The whistle itself differs from the ordinary locomotive-whistle by having a projecting ledge or rim around the lower part through which the sheet of steam issues to strike against the lower edge of the bell. What effect this projecting ledge or rim may have is not known to the observers. This whistle is provided, (for the purpose of concentrating the sound in a given direction,) with a hollow truncated pyramid 20 feet long, 10 feet square at the large end, and 2½ feet square at the small end, the axis of the pyramid being placed parallel to the horizon, with the whistle at the smaller end. In order to ascertain the effect of this appendage to the whistle the simplest plan would have been to have noted the intensity of sound at various points on a circle of which the whistle would have been the center. This being impracticable on account of the intervention of the land, the observations were confined to points on the three arcs of a circle of about 120°, of which the axis divided the space into 80° and 40° and a radius of one, two, and three miles. The result of these observations was that, starting from the axis of the trumpet on the east side, the sound grew slightly less loud until the prolongation of the side of the trumpet was reached, when it became comparatively faint and continued so until the line be-

tween the whistle and observer was entirely unobstructed by the side of the trumpet, when the sound was apparently as loud as in the prolongation of the axis itself. On the west side of the axis of the trumpet the sound in a like manner diminished from the axis until the prolongation of the side of the trumpet was reached, when it became feeble again, slightly increased, and then gradually diminished until the line of direction made an angle of about 80° with the axis of the trumpet, when it ceased to be heard at a distance of about one and a half miles. It should be observed, however, that at this point the line of sight of the observers was obstructed by the side of the trumpet and the smoke-stack of the boiler. The wind was light, at south-southwest, approximately in direct opposition to the direction of the sound when it ceased to be heard. We are informed that complaints had previously been made by officers of steamers passing near this point that the sound was here inaudible previous to the introduction of this trumpet; it would therefore follow that it is of no use in increasing the effect on the western side of the axis and is of injury to the sound on the lines of prolongation of its sides. If the sound ceased to be heard at the point mentioned, when the trumpet is removed the only apparent cause of the phenomenon will be the prevailing direction of the wind, which, coming from the southwest, will be in opposition to the sound of the whistle; but in the case of the present investigation the force of the wind was so small that it scarcely appeared adequate to produce the effect, and this question, therefore, must be left for further investigation. It may be important to state that in the case where the sound ceased to be heard it was regained by sailing directly toward the station about one mile, or at half a mile from the station. After making the foregoing observations as to the intensity of sound in different directions from the station, the observations were closed by sailing directly along the axis of the trumpet until the sound, which gradually grew fainter as the distance increased, finally ceased to be heard at a distance of about nine miles. In comparing this last result with an instrument of about the same power at Whitehead, which gave a perceptible sound at a distance of fifteen miles, the only apparently variable circumstance was the velocity of the wind, in both cases adverse to the direction of the sound; but in that of Cape Elizabeth it was of considerable more intensity.

During the foregoing experiments, when the vessel was about a mile from the station, steaming directly outward, in the prolongation of the axis of the instrument, there was heard after each sound of the whistle a distinct echo from the broad, unobstructed ocean, which was attributed at the time, as in other cases, to reflections from the crests and hollows of the waves, a similar phenomenon having since been referred to a reflection from air of a different density. This observation becomes important in regard to the solution of the question as to the abnormal phenomena of sound.

Cape Ann Light-Station, Massachusetts, August 31, 1873.—This is one of the most important stations on the New England coast. It is furnished with two first-order lights, and a 12-inch steam-whistle, actuated by 60 pounds pressure of steam. The present is the fourth engine which has been erected at this station, in consequence of the complaints either as to the inefficiency of the sound or its failure to be heard in certain directions. It was at first proposed to sail entirely around the island in order to test the intensity of the sound in different directions, but this was found impracticable on account of want of depth of water on the inland side; the observations were therefore confined to the direction in which complaints had been made as to the deficiency of the signal, namely, in a southerly direction. The result of these observations, the points of which included an arc of 120°, was that the sound was heard with equal intensity except when the direction of the station was to the northward and eastward of the observers; then, in one instance, the sound became very indistinct, and in another was entirely lost, both at a distance of about two miles. In these cases the line of sight between the observers and the signal was interrupted, in the first by a small building, the gable-end of which was within 10 feet of the whistle, and in the second by the south light-tower, which is within 30 feet of the whistle. In this series of experiments, as with the last, the wind was against the sound; the effect was noted by passing over the arc several times at different distances. The wind was from the southward and westward and very light, and the sound was finally lost at about six miles, and in the direction of the obstructions.

Boston Light-Station, August 31, 1873.—The light-house is situated on a low, rocky island, on the north side of the main outer entrance to Boston Harbor, nine miles from the city. It is furnished with three caloric engines, two of the second class and one of the first. The two second-class engines are so arranged as to act separately or together, and in the latter arrangement serve to duplicate the larger engine. At the time the observations were made, the larger engine was about being repaired, and one of the smaller engines with the double air-reservoir was used. The larger engine is used with 12 pounds pressure of air, which falls to 8 pounds in producing the sound. The smaller engine, with the double reservoir, is started with 9 pounds pressure, which falls to 8 pounds. This difference in the pressure of air in the two engines is caused by the larger ratio of the reservoir to the size of the reed. With a greater pressure than 12 pounds to the square inch in the larger engine and 9 pounds in the smaller no sound is produced; the reed is unable to act against the pressure, and, consequently, the orifice remains closed. The trumpet of the larger of the engines is reported to have been heard eighteen miles at sea, which, in consideration of the results obtained at Whitehead, we thought very probable. The time required, from starting fires, to get a good working-pressure, is about half an hour. The amount of coal consumed per hour is 17 pounds.

There is moreover at this station a bell, operated by a Stevens clock, not at present used. It is placed on a high, wooden frame-structure, on which one of the ancient bell-striking machines was originally erected. The most proper position for the fog-signal is on the ground occupied by this bell-tower, but as this was not removed at the time of the erection of the trumpets, they were placed in such positions as to have the line of sound interrupted to the northeastward by the bell and light towers. It was therefore thought probable that this was the cause of the deficiency of sound in this direction. To test this the vessel was caused to traverse the arcs of several concentric circles, in the portion of the horizon where the sound was most required as a signal. The first arc traversed was about one and one-half miles from the signal. The vessel on this crossed the axis where the sound was quite loud, and proceeded northward until the sight of the trumpet was obscured by the beforementioned towers, when the sound became almost inaudible. The vessel next returned across the axis, on a circle of about three miles radius, with similar results; but after crossing the axis the sound on the southern side continued to be but little diminished in intensity along an arc of two and a half miles, or as far as the land would allow the vessel to go. The vessel was next put upon an arc, of which the radius was one and a half miles, and on the south side of the axis, and sailed to the northward until the axis was reached, it was then turned and ran for the entrance of the harbor, hugging the southern shore, keeping as far from the signal as possible. Throughout this passage the sound was clear and loud, showing very little, if any, diminution of power as the several positions deviated more and more from the direction of the axis, until the vessel was at right angles with the axis, the land not permitting any greater distance. The vessel approached to within three-quarters of a mile of the signal and then continued still farther around, until nearly in the rear of it, the sound still continuing clear and loud. The vessel next proceeded up the harbor, nearly in the line of the axis of the trumpet prolonged in the rear, still continuing to hear the signal distinctly until the keeper, losing sight of the vessel, stopped sounding the instrument. These observations were made under very favorable circumstances, it being nearly calm. What wind did exist was about equally favorable to points on either side of the axis. The inference from these observations is, first, that small objects placed near the source of sound tend to diminish its intensity in the direction of its interruption, and should, therefore, if possible, be removed, or the instrument so placed as to obviate such obstructions; and, second, that, even with the trumpet, the sound so diverges from the axis as to be efficient even in the rear of the instrument.

Observations on Fog-Signals, August 25, 1874.

The first of these was on board the steamer Putnam, at Little Gull Island, with Admiral Trenchard, inspector of lights of the third dis-

trict, accompanied by Governor Ingersoll, of Connecticut, and Captain Upshur, U. S. N.

At this place are two sirens, the one to replace the other in case of an accident. One of the sirens was sounded with the pressure of 50 pounds per square inch. The wind was across the axis of the trumpet, and almost precisely at right angles to it.

The steamer was headed against the wind, on a line at right angles to the axis of the trumpet. The sound in this case also travelled against the wind, which was at an estimated velocity of from 4 to 5 miles per hour. The distance travelled before the sound became inaudible was estimated, by the speed of the steamer, at 3½ miles.

The steamer was next headed in an opposite direction and returned along its previous path, across the mouth of the trumpet of the siren, the sound gradually increasing in strength without any marked irregularity, until the siren was reached, and on leaving this, the course remaining the same, the sound gradually diminished in intensity, but with less rapidity than before, until it was finally lost at a distance of 7½ miles. In the latter instance the movement of the sound was with the wind. The result of these observations was conformable to that generally obtained from previous observations, namely, that the sound is seldom or never heard at the same distance in different directions, and, moreover, that it is generally heard farther with the wind than against it.

The observations of this day also illustrate the spread of the sound-wave on either side of the axis of the trumpet, a fact which has frequently been observed in other investigations. It may be well to mention that the siren trumpet at this locality is directed horizontally with its prolonged axis passing over, immediately in front of the mouth of the trumpet, a space of very rough ground, the surface of which is principally composed of bowlders, one of which, of very large size, is directly in front of the trumpet, and the idea occurred to me that this rough surface might produce some effect on the transmission of sound to a distance. I observed by strewing sand upon a paper that the former was violently agitated when held near the surface of the large bowlder just mentioned, during the blast of the siren trumpet.

At this station, during the visit of Sir Frederick Arrow, the sound was lost in the direction of the axis of the trumpet at a distance of two miles, and then again regained with distinctness at the light-vessel, a distance of four and one-half miles; this was what we have denominated as an abnormal phenomenon, which we think was due to a slight variation in the velocity of the lower or upper part of the current of air, but, unfortunately, the demand for the use of the vessel as a light-house tender prevented the attempt to ascertain whether the same phenomenon would be observed a second time and to further investigate its cause.

The second investigations this season were September 1, 1874, with General Barnard, of the Light-House Board, and General Woodruff,

engineer of the third district. We proceeded on this occasion in the steamer Mistletoe to Block Island, one of the outer stations of the Light-House Board, fully exposed, without intervention of land, to the waves and storms of the ocean.

On the southerly side of this island a light-house is about being erected, and a siren station at this locality had been established and was in full operation.

There are here two sirens attached to one boiler, one to be used in case of an accident to the other. For the sake of experiment they are of slightly different qualities, one with a larger trumpet with a revolving disk of the old pattern, giving a lower tone; the other a smaller trumpet, having a revolving disk with openings allowing a much more sudden full blast of steam, and revolving with greater velocity so as to give a higher pitch. The latter is far the superior instrument, as was evident to us by the sound which it produced, and as had been established by the use of the artificial ear in the manufactory of Mr. Brown. The effect on the unguarded ear was scarcely endurable, and the very earth around appeared to tremble during the blast. The keeper (an intelligent man who has been promoted from the station of assistant keeper at Beaver Tail light to this station) informed us that a fleet of fishing-vessels coming in distinctly heard it at a distance estimated by their rate of sailing at scarcely less than thirty miles; this was on two separate occasions. The keeper had been directed to note and record the date at which he heard the sound from other signals; he reported that he had frequently heard the fog-signal at Point Judith, a distance of seventeen miles, and that the observer at the latter place frequently heard his signal; but on comparing records the two sounds had not been heard simultaneously by the two keepers; when it was heard from one station it was not heard from the other, illustrating again the general rule that sound is not transmitted simultaneously with equal intensity in opposite directions.

This occasion also furnished very favorable conditions for observing the remarkable phenomenon of the ocean-echo. At the cessation of each blast of the trumpet, after a slight interval, a distinct and prolonged echo was returned from the unobstructed ocean. It is important to observe, in regard to this phenomenon, that the siren is placed near the edge of a perpendicular cliff, at an elevation of from 75 to 100 feet above the ocean, and, furthermore, that the direction of the wind formed an angle of about 35° with the axis of the trumpet. Now, the loudness of this echo was not the greatest at the siren-house, but increased in intensity until a point was reached several hundred yards from the trumpet, approximately more in accordance with a reflection from the waves. The wind was blowing from the shore with the direction of the sound as it went off from the trumpet, and nearly against it on the return of the echo. I have attributed this phenomenon, which was first observed in 1866 at East Quoddy Head on the coast of Maine, and since

at various stations, at which the trumpet or siren has been used, to the reflection of the sound from the crests and slopes of the waves, and the observation we have mentioned would appear to favor this hypothesis. In connection with this explanation, I may mention that my attention has been called by General Meigs, of the United States Army, to an echo from the palings of a fence, and also from a series of indentations across the under side of the arch of one of the aqueduct bridges of the Washington water-works. The fact that the sound was much louder at a point considerably distant from the trumpet was noted by one of the party entirely unacquainted with the hypothesis.

The keeper at this station confirmed without a leading question the statement of Captain Keeney, that it frequently happens that a feeble sound of a distant object, as the roar of the surf, can be heard against the direction of the wind, and that in this case it always betokens a change in the weather, and is, in fact, used generally by the fishermen as a prognostic of a change in the direction of the wind, which will, in the course of a few hours, invariably spring up from an opposite quarter. In such case, it is highly probable, as has been stated, that a change has already taken place in the direction of the upper strata of the air, although, from theoretical considerations, we might infer that the same result would be produced if the wind were stationary above and moving with a considerable velocity in a direction opposite to the sound at the surface of the earth, the velocity gradually diminishing as we ascend, for in this case, also, the inclination of the sound waves would be downward.

The third series of investigations, September 23, 24, 1874, was made in company with Captain John Davis and Major Hains, both of the Light-House Board, and General Woodruff, engineer of the third district, and Mr. Brown, patentee of the siren. For the purpose three light-house tenders were employed, viz: Mistletoe, Captain Keeney; Putnam, Captain Field; Cactus, Captain Latham.

The place of operation chosen for the first day's series was about $1\frac{1}{2}$ miles from the northern point of Sandy Hook.

From the experience gained by the accumulated observations which had been made, it was concluded that the phenomena of sound in regard to perturbing influences could not be properly studied without simultaneously observing the transmission of sound in opposite directions. It was therefore concluded to employ at least two steamers in making the investigations.

In regard to this point the commission was fortunate in being able to command the use, for a limited period, of the three tenders mentioned above, which happened to be at the time assembled at the light-house depot, Staten Island, and could be spared from their ordinary operations for a few days without detriment to the service. It was also fortunate in selecting for the scene of the investigations an unobstructed

position in the lower bay of New York, and perhaps still more fortunate in the season of the year when, on account of the heat of the sun, a land and sea breeze, which changed its direction at a particular hour of the day, enabled results to be obtained bearing especially on the phenomena to be investigated.

Attention was first given to the character of the several steam-whistles which were intended to be used as the sources of the sound during the series of investigations.

These whistles, which were sounded during the whole of the observations with 20 pounds of steam on each boiler, gave at first discordant sounds, and were found by their effect upon an artificial ear to be considerably different in penetrating power; they were then adjusted by increasing or diminishing the space between the bell and the lower cylinder by turning a screw on the axis of the bell intended for that purpose, until they produced the same effect upon the sand in the membrane of the artificial ear; but in order to further be insured of the equality of the penetrating power of the several whistles, the three steamers abreast, forming as it were a platoon, were directed to proceed against the wind, sounding all the time in regular succession—the Cactus first, then, after an interval of a few seconds, the Mistletoe, and then the Putnam—until the stationary observers lost the sound of each. They became inaudible all very nearly at the same moment. The sound of the Putnam was thought to be slightly less distinct; it was therefore chosen as a station-ary vessel, from which the observations of the sound of the other two were to be made.

The Putnam being anchored at the point before mentioned, arrangements were made for sending off the other two vessels in opposite directions, one with and the other against the wind, with instructions to return when the sound became inaudible to those on the stationary vessel, this to be indicated by a flag-signal. It should be mentioned that the velocity of the wind was measured from time to time during the subsequent experiments with one of Robinson's hemispherical cup anemometers, made by Casella, of London. The velocity of the wind first observed by this instrument, just before the starting of the vessels, was 6 miles per hour, the instrument being freely exposed on the paddle-boxes of the steamer. A sensitive aneroid barometer marked 30.395 in. and continued to rise gradually during the day to 30.43 in. the temperature was 71° F.

The vessels left at 11:18 A. M. the wind being from the west, Captain Davis taking charge of the sounding of the whistle on the Cactus, which proceeded east with the wind, the sound coming to the ear of the observer against the wind; while the sounding on the Mistletoe was in charge of General Woodruff, and, as the vessel steamed against the wind, the sound came to the observers on the stationary vessel with the wind; the other members of the party remained on the Putnam, at anchor at the point before mentioned, off the Hook, Major Hains having charge of the signals. The sound of the first of the vessels was heard faintly at 14 min-

utes after leaving, but not heard at 16 minutes; we may therefore assume that it became inaudible at 15 minutes. And within a minute of the same time, by a mistake of the signal, the other ceased to advance, and commenced to come back; the sound from it, however, was very distinct, while at the same moment the sound from the other was inaudible. On account of the mistake mentioned, the relative distance at which the sounds from the two vessels might have become inaudible cannot be accurately given; but the fact observed, that the sound which came with the wind was much more audible than the other, is in conformity with the generally observed fact that sound is heard farther with the wind than against it. In the mean time the velocity of the wind had sunk to 1½ miles per hour.

Next, the vessels, leaving at 11:55 A. M. changed positions; the Cactus, under Captain Davis, steamed west, directly in the direction from which the wind came, while the Mistletoe, under General Woodruff, steamed east, directly before the wind. The result of this trial was well marked in all respects; the sound of the Mistletoe was lost in 9 minutes, which, from the speed of the steamer, was estimated at about 1½ miles, while the sound of the Cactus was heard distinctly for 30 minutes, or at an estimated distance of 5 miles. The wind at the middle of this trial had sunk to 0.42 mile per hour, or nearly to a calm. The result of this trial was somewhat abnormal, for though the wind had sunk nearly to a calm, the sound was still heard three times as far in the direction of the slight wind as against it.

After a lapse of an hour and a half a third trial was made; in the mean time the wind had changed within two points of an exactly opposite direction, blowing, from the indications of the anemometer, at the rate of ten and one-half miles per hour.

The Cactus again steamed in the eye of the wind, which was now however from nearly an opposite point of the compass, while the other vessel steamed in an opposite direction. The sound of the Cactus was lost at the end of twenty-seven minutes, with the wind, or at a distance of four and a half miles.

The sound of the Mistletoe was lost at the end of thirty minutes, or at a distance of five miles, moving against a brisk wind then blowing.

This result was entirely unexpected and much surprised every member of the party, since it was confidently expected that an increase in the intensity of the wind of more than ten miles per hour, and a change to the opposite direction, would materially affect the audibility of the sound, and give a large result in favor of the sound, which moved in the same direction with the wind, but this was not the case. In the course of all the observations in several years in which investigations have been carried on under the direction of the chairman of the board, this is the only instance in which he had heard a sound at a greater distance against the wind than with it, although, as before stated, a num-

ber of cases have been reported by other observers in which, under peculiar conditions of the weather, this phenomenon has been observed.

To briefly recapitulate the results, we have in this case three instances, in succession, in which a sound was heard farther from the west than from the east, although in the mean time the wind had changed to nearly an opposite direction. Had these results been deduced from the first observations made on the influence of wind on sound, or, in other words, without previous experience, the conclusion would have been definitely reached that something else than wind affected the conveyance of sound, and this conclusion would have been correct, if the suggestion had been confined to the wind at the surface; but from previous observations and theoretical conclusions, the observed phenomena are readily accounted for by supposing that during the whole time of observation the wind was blowing from the west in the higher part of the aerial current, and that the calm and opposing wind observed were confined to the region near the surface. To test this hypothesis, Major Hains constructed a balloon of tissue-paper, which, after being completed, was unfortunately burned in the attempt to inflate it with heated air.

The remainder of this day was devoted to observations on the sound of the siren at the light-house at Sandy Hook. For this purpose the Cactus, under Captain Davis, was directed to steam in the eye of the wind, while the Mistletoe, under General Woodruff, steamed before the wind, and the Putnam steamed at right angles to the wind. Unfortunately, on account of the diminution of light at the closing in of the day, nothing could be observed. The only result obtained was that one of the duplicate sirens was heard more distinctly than the other, namely, the one with the higher note.

Experiments September 24, 1874.—The place chosen for the observations of this day was still farther out in the ocean, at the Sandy Hook light-vessel, 6 miles from the nearest point of land. The pressure of the atmosphere was a little greater than the day before, being 30.52; the temperature about the same, 72° Fahr. wind light, from a westerly direction, as on the previous day, with a force, as indicated by the anemometer, of 1.2 miles per hour. Having been provided with a number of India-rubber toy balloons, the two vessels were sent off in opposite directions—the Mistletoe toward the west, against the wind, the Cactus toward the east, with the wind, leaving at 10:40 A. M. A change was also made in observing the sound. In these observations the sound was noted at each vessel from the other, the speed of the steamers being the same; the distance between them when the Mistletoe lost the sound of the Cactus was two miles, while the Cactus continued to hear the Mistletoe's sound coming with the wind until they were four miles apart. Simultaneously with this observation a balloon was let off from the Putnam at the light-vessel, which, in its ascent, moved continuously obliquely

upward in a line slightly curving toward the horizon, in the direction of the wind at the surface, as far as it could be followed with the eye, indicating a wind in the same direction in the several strata through which it passed, but of a greater velocity in the upper strata.

The vessels now changed places, the Cactus steaming west, the Mistletoe east, the wind having entirely ceased at the surface of the earth. In this case the Cactus lost the sound of the Mistletoe when the vessels were two miles apart, while the Mistletoe continued to hear the sound of the Cactus until they were three miles apart. A balloon let off ascended vertically until it attained an elevation of about one thousand feet, when, turning east, it followed the direction of the previous one. The sound in this case from the east was heard three miles, while that from the west was heard two miles, while in the preceding observations the distances were as 2 to 1; the only changing element, as far as could be observed, was that of the wind at the surface, which became less.

Third trial, 12:45 P. M.—The wind previous to this trial had changed its direction 10 points or about 112½° round through the south, and as indicated by the anemometer at a velocity of 4.8 miles per hour. In this case the Cactus, going against the wind, lost the Mistletoe's sound coming to her against the wind when the vessels were 1 mile apart, while the Mistletoe heard the Cactus, the sound coming to her with the wind when the vessels were 1⅞ miles apart. The several balloons set off at this time were carried by the surface wind westwardly until nearly lost to sight, when they were observed to turn east, following the direction of the wind observed in the earlier observations. The results of the whole series of observations are extremely interesting. In all the experiments the difference in the audibility of the sound in different directions was very marked, and indeed it rarely happens that the sound is equal in two directions, although from the hypothesis adopted this may be possible, since, according to this hypothesis, both the upper and lower currents have an influence upon the audibility of sound in certain directions. From the first trial, the motion of the air being in the same direction both below and above, but probably more rapid above than below on account of resistance, the upper part of the sound-wave would move more rapidly than the lower, and the wave would be deflected downward, and therefore the sound, as usual, heard farther with the wind than against it. In the third experiment of the same day, in which the wind changed to an almost opposite direction, if the wind remained the same above, as we have reason to suppose it did from the observations on the balloons on the second day, the sound should be heard still farther in the same direction or against the wind at the surface, since, in this case, the sound-wave being more retarded near the surface would be tipped over more above and the sound thus be thrown down.

The observations of the second day are also in conformity with the same hypothesis, the change in the wind being probably due to the heating of the land, as the day advanced, beyond the temperature of

the water, and thus producing a current from the latter to the former, while the wind observed in the morning from the west was the land-wind due to the cooling of the latter.

In the morning the wind was blowing from the west both in the higher strata and at the surface of the earth, and in this condition the sound was heard farther with the wind than against it.

The wind at the surface about midday gradually ceased, and shortly afterward sprang up from an east direction; in this condition the sound, with the wind at the surface, was heard at a greater distance. This is also in strict conformity with the theory of a change in the form of the sound-wave, as in the latter case the lower portion would be retarded, while the upper portion of the wave would be carried forward with the same velocity, and hence the sound would be thrown down on the ear of the observer. To explain the result of the third trial of the second day, we have only to suppose that the influence of the upper current was less than that of the lower. The conditions for these observations were unusually favorable, the weather continuing the same during the two days, and the change of the wind also taking place at nearly the same hour.

The fact thus established is entirely incompatible with the supposition that the diminution in the sound is principally caused by a want of homogeneity in the constitution of the atmosphere, since this would operate to absorb sound equally in both directions.

In May, 1873, Professor Tyndall commenced a series of investigations on the subject of the transmission of sound, under the auspices of the Trinity House, of England, in which whistles, trumpets, guns, and a siren were used, the last-named instrument having been lent by the Light-House Board of the United States to the Trinity House for the purpose of the experiments in question. The results of these investigations were, in most respects, similar to those which we had previously obtained. In regard to the efficiency of the instruments, the same order was determined which has been given in this report, namely, the siren, the trumpet, and the whistle. Professor Tyndall's opinion as to the efficiency of the siren may be gathered from the following remarks. Speaking of the obstruction of sound in its application as a fog-signal, he says, "There is but one solution of this difficulty, which is to make the source of sound so powerful as to be able to endure loss and still retain sufficient residue for transmission. Of all the instruments hitherto examined by us the siren comes nearest to the fulfillment of this condition, and its establishment upon our coasts will, in my opinion, prove an incalculable boon to the mariner." Professor Tyndall arrived at the conclusions which the information we had collected tended to establish, that the existence of fog, however dense, does not materially interfere with the propagation of sound; and also that sound is generally heard farther with the wind than against it, although the variation of the in-

tensity of the sound is not in all cases in proportion to the velocity of the wind. The result of his investigations in regard to the pitch of sound was also similar to those we have given; and, indeed, all the facts which he has stated are, with a single exception as to the direction of the echo, in strict accordance with what we have repeatedly observed. We regret to say, however, that we cannot subscribe to the conclusions which he draws from his experiments as to the cause of the retardation of sound that it is due to a flocculent condition of the atmosphere, caused by the intermingling with it of invisible aqueous vapor.

That a flocculent condition of the atmosphere, due to the varying density produced by the mingling of aqueous vapor, is a true cause of obstruction in the transmission of sound is a fact borne out by deduction from the principles of wave-motion, as well as by the experiments of the distinguished physicist of the Royal Institution of Great Britain; but from all the observations we have made on this subject we are far from thinking that this is the efficient cause of the phenomena under consideration. A fatal objection, we think, to the truth of the hypothesis Professor Tyndall has advanced is that the obstruction to the sound, whatever may be its nature, is not the same in different directions. We think we are warranted in asserting that in the cases of acoustic opacity which he has described, if he had simultaneously made observations in an opposite direction, he would have come to a different conclusion. That a flocculent condition of the atmosphere should slightly obstruct the sound is not difficult to conceive; but that it should obstruct the ray in one direction and not in an opposite, or in a greater degree in one direction than in another, the stratum of air being the same in both cases, is at variance with any fact in nature with which we are acquainted. We would hesitate to speak so decidedly against the conclusions of Professor Tyndall, for whose clearness of conception of physical principles, skill in manipulation, and power of logical deduction we entertain the highest appreciation, were the facts which were obtained in our investigations of a less explicit character.

While the phenomena in question are incompatible with the assumption of a flocculent atmosphere as a cause, they are in strict accordance with the hypothesis of the refraction of the waves of sound due to a difference in velocity in the upper and lower portions of the currents of air. We do not say, however, that the transmission of sound in the atmosphere is fully investigated, or that the abnormal phenomena which are said to have been observed in connection with fog-signal stations have been fully explained. So far from this, we freely admit we are as yet in ignorance as to how the hypothesis we have adopted is applicable to the critical explanation of the obstruction to sound in the abnormal cases mentioned by General Duane. We feel, however, considerable confidence in its power to afford a rational explanation of these phenomena when the conditions under which they exist shall have been accurately determined.

We are farther confirmed in our conclusion by the publication of an interesting paper in the proceedings of the Royal Society by Professor Osborne Reynolds, of Owens College, Manchester, intended to show that sound is not absorbed by the condition of the atmosphere, but refracted in a manner analogous to the hypothesis which has been adopted in the preceding report.

Much further investigation is required to enable us to fully understand the effects of winds on the obstruction of sound, and to determine the measure of the effect of variations of density in the air due to inequality of heat and moisture. But such investigations can only be made under peculiar conditions of weather and favorable localities, with the aid of a number of steamers, and a series of observers, by whom the transmissibility of the air may be simultaneously observed in different directions. The position which we were so fortunate to obtain in our experiments in the lower bay of New York at the season of the prevalence of land and sea breezes was exceptionally favorable for the study of the action of wind upon sound. It is the intention of the Light-House Board to continue observations in regard to this matter, and to embrace every favorable opportunity for their prosecution under new and varied conditions.

LIGHT-HOUSE BOARD, *October*, 1874.

PART IV.—INVESTIGATIONS IN 1875.*

PRELIMINARY REMARKS.

In the Appendix to the Light-House Report of 1874 I gave an account of a series of investigations relative to fog-signals, which had been made at different times under the direction of the chairman of the committee on experiments.

These investigations were not confined to the instruments for producing sound, but included a series of observations on sound itself, in its application to the uses of the mariner. In the course of these investigations the following conclusions were early arrived at:

1st. That the rays of a beam of loud sound do not, like those of light, move parallel to each other from the surface of a concave reflector, but constantly diverge laterally on all sides; and, although at first they are more intense in the axis of the reflector, they finally spread out so as to encompass the whole horizon, thus rendering the use of reflectors to enforce sound for fog-signals of little value.

2d. That the effect of wind in increasing or diminishing sound is not confined to currents of air at the surface of the earth, but that those of higher strata are also active in varying its transmission.

3d. That although sound is generally heard farther with the wind than against it, yet in some instances the reverse is remarkably the case, espec-

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* From the Report of the Light-House Board, for 1875.

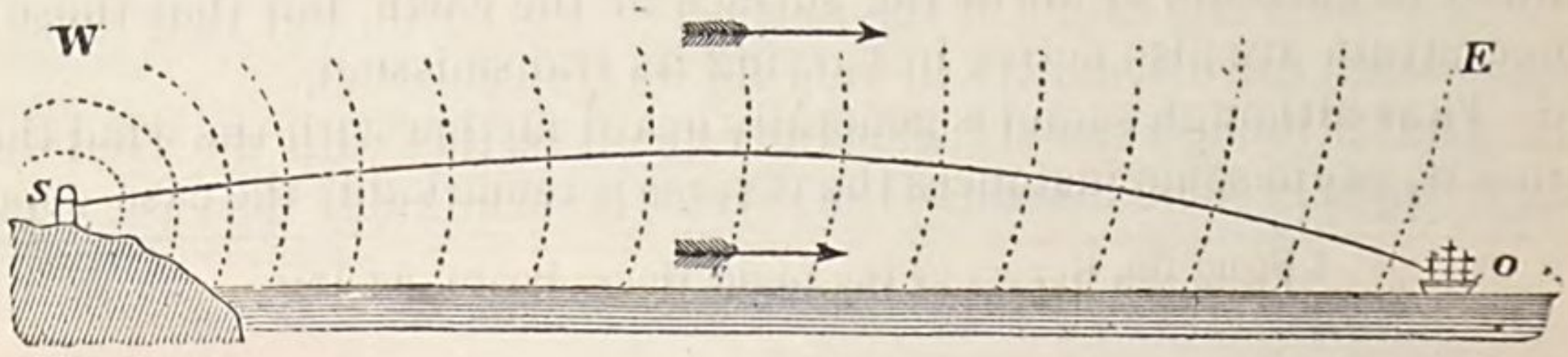
ially in one locality; in which the sound is heard against a northeast snow-storm more distinctly than when the wind is in an opposite direction. This anomaly was referred to the action of an upper current in an opposite direction to that at the earth, such a current being known to exist in the case of northeast storms on our coast. But in what manner the action of the wind increased or diminished the audibility of sound was a problem not solved. It could not be due, as might be thought at first sight, to the acceleration of the sonorous impulse by the addition of the velocity of the wind to that of sound, on the one hand, nor to the retardation of the latter by the motion of the wind, on the other. The inadequacy of this explanation must be evident when we reflect that sound moves at the rate of 750 miles an hour, and therefore a wind of 7½ miles an hour would only increase its velocity one per cent.; whereas the actual increase in audibility produced by a wind of this intensity is in some instances several hundred per cent.

In this state of our knowledge, a suggestion of Professor Stokes, of Cambridge, England, which offered a plausible explanation of the action of the wind, became known to us, and was immediately adopted as a working hypothesis to direct investigations.

This suggestion, the importance of which appears to have escaped general recognition, is founded on the fact that the several strata into which a current of air may be divided do not move with the same velocity. The lower stratum is retarded by friction against the earth and by the various obstacles it meets with, the one immediately above by friction against the lower, and so on; hence the velocity increases from the ground upward—a conclusion established by abundant observation. Now, in perfectly still air, a sounding instrument, such as a bell, produces a series of concentric waves perfectly spherical; but in air in motion the difference of velocity above and below disturbs the spherical form of the sound-wave, giving it somewhat the character of an oblique ellipsoid, by tending to flatten it above—to the windward, and to increase its convexity above—to the leward; and since the direction of the sound is perpendicular to the sound-wave, against the wind it will be thrown upward above the head of the observer, and in the opposite direction downward toward the earth. A similar effect will be produced, but with some variations and perhaps greater intensity, by a wind above, opposite to that at the surface of the earth.

These propositions will be rendered plain by the following illustrations (Figures 1, 2, and 3), for which I am indebted to an article in the American Journal of Science, by William B. Taylor.

Fig. 1.



In these, Figure 1 represents the effect of a favorable wind in depressing the waves of sound, S being the signal-station and O the point of observation. The wind blowing from W to E, as the spheroidal faces of the sonorous waves become more pressed forward by the greater velocity of the wind above, assuming it to be retarded at the surface by friction, and the direction of the acoustic beam being constantly normal to the wave-surfaces, the lines of direction of the sound will gradually be bent downward and reach the ear of the observer with an accumulated effect at the point O.

Fig. 2.

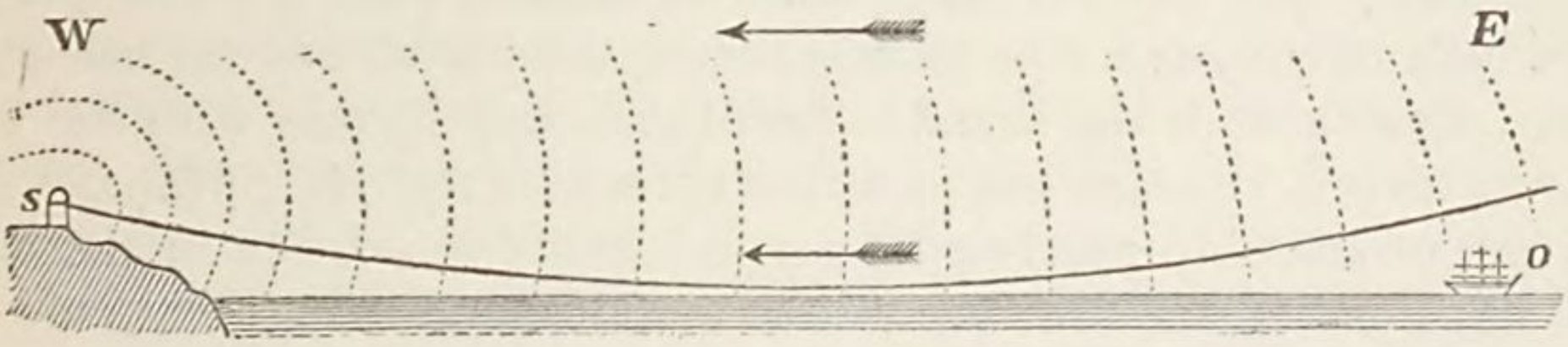


Figure 2 represents the ordinary effect of an opposing wind blowing from E to W against the sound; the wave-faces being more resisted above than below, assuming as before a retardation at the surface, the sound-beams are curved upward, and the lowest ray that would reach, in still air, the distant observer at O, is gradually so tilted up that it passes above the ear of the listener, leaving him in an acoustic shadow.

Fig. 3.

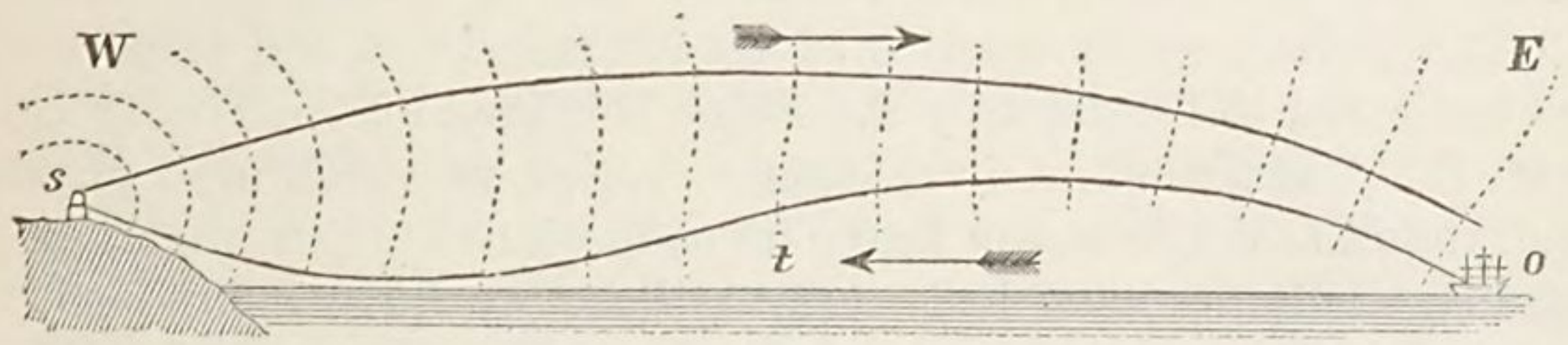


Figure 3 represents the disturbing effect of two winds, the lower in opposition to the sound at the surface, and the upper with it. In this case the principal effect will be a depression of the sound-beam, similar to that shown in Figure 1, but more strongly marked, as the difference of motion will be greater as we ascend. Attending this action, says Mr. Taylor, there will probably be some lagging of the lower stratum by reason of the surface-friction, the tendency of which will be to distort the lower part of the sound-waves, giving them a reverse or serpentine curvature. In this case the upper ray of sound would only have a single curvature, similar to that shown in Figure 1, while the lower rays would be represented by the lower line S O, rendering the sound less audible at an intermediate point, *t*, than at the more distant station O. This hypothetical case of compound refraction offers a plausible explanation of the paradox of a nearer sound being diminished in power by the wind which increases the effect of a more distant one.

In these figures and all the succeeding ones the direction of the wind is indicated by arrows.

The hypothesis we have adopted in connection with the fact of the lateral spread of sound gives a simple explanation of various abnormal phenomena of sound such as has been observed in the previous investigations, and of which the following are examples: First, the audibility of a sound at a distance, and its inaudibility nearer the source of sound; second, the inaudibility of a sound at a given distance in one direction, while a lesser sound is heard at the same distance in an opposite direction; third, the audibility of the sound of an instrument at one time at the distance of several miles, while at another time the sound of the same instrument cannot be heard at more than a fifth of the same distance; fourth, while the sound is heard generally farther with the wind than against it, in some instances the reverse is the case; fifth, the sudden loss of sound in passing from one locality to another in the same vicinity, the distance from the source of the sound being the same.

The first four of these phenomena find a ready explanation in the hypothesis adopted by supposing an increase or diminution in the relative velocity of the currents of wind in the upper or lower strata of air. The fifth is explained by the interposition of an obstacle which casts, as it were, a sound-shadow, disappearing at a given distance by the divergence of the rays on each side of the obstacle into what would be an optical shadow.

Accounts of these investigations were presented from time to time to the Light-House Board, and to the Philosophical Society of Washington in 1872. Subsequently a series of investigations on the same subject was instituted in England by the Elder Brethren of the Trinity House, under the direction of their scientific adviser, the celebrated physicist, Dr. Tyndall. While in the latter investigations various abnormal phenomena, similar in most instances to those we have mentioned, were observed, they were referred by Dr. Tyndall to an entirely different cause, viz, to the existence of acoustic clouds, consisting of portions of the atmosphere in a flocculent or mottled condition, due to the unequal distribution of heat and moisture, which, absorbing and reflecting the sound, produce an atmosphere of acoustic opacity. While we do not deny the possible existence of such a condition of the atmosphere, we think it insufficient to account for all the phenomena in question, and believe that a more general and efficient cause is that of the *wind*, in accordance with the hypothesis of Professor Stokes.

We regret to differ in opinion from Dr. Tyndall, and have published our dissent from his views in no spirit of captious criticism or desire to undervalue the results he has obtained, some of which are highly important. Our only object in our remarks and in our investigations is the establishment of truth.

The determination of the question as to the cause of the abnormal phenomena of sound we have mentioned, and the discovery of new phe-

nomena, are not mere matters of abstract scientific interest, but are of great practical importance, involving the security of life and property, since they include the knowledge necessary to the proper placing of fog-signals, and the instruction of mariners in the manner of using them.

The hypothesis we have adopted, that of the change of direction of sound by the unequal action of the wind upon the sound-waves, is founded on well-established mechanical principles, and offers a ready explanation of facts otherwise inexplicable. It is also a fruitful source from which to deduce new consequences to be verified or disproved by direct experiment. It would however ill become the spirit of true science to assert that this hypothesis is sufficient to explain all the facts which may be discovered in regard to sound in its application to fog-signals, or to rest satisfied with the idea that no other expression of a general principle is necessary. An investigation however to be fruitful in results, as a general rule, must be guided by *a priori* conceptions. Hap-hazard experiments and observations may lead to the discovery of isolated facts, but rarely to the establishment of scientific principles. There is danger however in the use of hypotheses, particularly by those inexperienced in scientific investigations, that the value of certain results may be overestimated, while to others is assigned less weight than really belongs to them. This tendency must be guarded against. The condition of the experiment must be faithfully narrated, and a scrupulously truthful account of the results given. While we have used the hypothesis above mentioned in the following investigations as something more than an antecedent probability, we have not excluded observations which may militate against it, and we hold ourselves ready to admit the application of other principles, or to modify our conception of those we have adopted, when new facts are discovered which warrant such changes. But we require positive evidence, and cannot adopt any conclusions which we think are not based upon a logical correlation of facts.

The investigations described in the following account, though simple in their conception, have been difficult and laborious in their execution. To be of the greatest practical value they were required to be made on the ocean, under the conditions in which the results are to be applied to the use of the mariner, and therefore they could only be conducted by means of steam-vessels of sufficient power to withstand the force of rough seas, and at times when these vessels could be spared from other duty. They also required a number of intelligent assistants skilled in observation and faithful in recording results.

Observations in August, 1875, at Block Island.

The party engaged in these investigations consisted of the chairman of the Light-House Board; General Woodruff, U. S. A., engineer third light-house district; Dr. James C. Welling, president of Columbian Uni-

versity, Washington, D. C.; Mr. T. Brown, of New York, patentee of the siren; Mr. Edw. Woodruff, assistant superintendent of construction; and Captain Keeney, commander of the light-house steamer Mistletoe.

They arrived at Block Island on the afternoon of the 4th of August, 1875. This place was chosen as the site of the experiments, first, on account of its insular position, being as it were in the prolongation of the axis of Long Island, distant fifteen miles from the most easterly part of the latter, and entirely exposed to the winds and waves of the Atlantic Ocean; and, secondly, because there are on Block Island two light-houses, one of which is of the first order, and connected with it are two fog-signals, one of them with the latest improvements. (See Fig. 4.)

Observations in regard to the Aerial Echo.

This phenomenon has been frequently observed in the researches of the Light-House Board, in case of powerful sounds from the siren and from the fog-trumpet.* It consists of a distinct reflection of sound as if from a point near the horizon in the prolongation of the axis of the trumpet. The question of the origin of this echo has an important bearing, according to Dr. Tyndall, on the explanation of the abnormal phenomena of sound we have mentioned. He refers it to the non-homogeneous condition of portions of the air, which reflect back the waves of sound in accordance with the analogy of the reflection of light at the common surface of two media of different densities. We have adopted, as a provisional hypothesis, that it is due to the reflection from the waves and the larger undulations of the surface of the ocean, in connection with the divergency of beams of powerful sounds. To bring these hypotheses to the test of a crucial experiment, arrangements were made, under the direction of Mr. Brown, to change the direction of the axis of one of the sirens from the horizontal to the vertical position.

The first observations were made August 5, with the siren in its usual horizontal position, while the air was so charged with fog as to render the sound of the instrument necessary for the guidance of the mariner, the image of the sun being obscured and the land invisible from the sea. Under these conditions an echo was heard when the pressure of the steam reached 50 pounds per square inch. The reflection in this case, as usual, was from a point in the sea-horizon in the prolongation of the axis of the trumpet. It was not, however, heard more distinctly when standing near the origin of the sound than at several hundred feet on either side of it. The interval between the cessation of the original sound and the commencement of the echo was not as marked as in some previous observations, not being more than four or five seconds. The

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*The same phenomenon is mentioned by Froissart in his account of the embarkation of the expedition of the French and English to the coast of Africa to assist the Genoese against the pirates in 1390. "It was a beautiful sight," says the chronicler, "to view this fleet, with the emblazoned banners of the different lords fluttering in the wind, and to hear the minstrels and other musicians sounding their pipes, clarions, and trumpets, whose sounds were re-echoed back by the sea." (See Illustrations of Froissart by H. N. Humphrey, Plate IV.)

duration of the echo was on the average about eight seconds, beginning with the time of its first perception, and not with the cessation of the sound of the trumpet. General Woodruff and Doctor Welling both noted the peculiar character of the echo, which was that of a series of reflections varying in intensity from a maximum, near the beginning, and gradually dying away. The wind was nearly at right angles to the axis of the trumpet and also to that of the crests of the swell of the ocean, which was rolling in from the effects of a commotion without. The barometer at 12 M. indicated 30.2 inches; the dry-bulb thermometer 73° F. the wet-bulb 70° F. indicating a remarkable degree of aqueous saturation. During the whole day the air in all the region around Block Island was undoubtedly in a homogeneous condition.

August 6.—On this day the weather was nearly the same. The fog-signal on the 5th instant was kept in operation for the use of the mariner nineteen hours, and on this day it was blown twenty hours continuously. The barometer marked 30.20 inches; the thermometer 70° F.; the fog not as equally distributed as on the preceding day; the north end of the island, distant four miles, being distinctly visible. The wind was S. W. to S., making an angle of about 60° with the axis of the fog-trumpet. The echo continued to be heard distinctly with a sound varying in intensity, but was not as loud as we have heard it on certain occasions in previous years.

During this and the preceding day, workmen were employed under Mr. Brown in inserting a flexible India-rubber tube, two inches in diameter, between the revolving plate of the siren and the smaller end of the trumpet, so that it might be brought into a vertical position. This work, though apparently simple, was difficult in execution, since it involved the necessity of strong supports for the cast-iron trumpet, which in itself weighed eight hundred pounds, and also of a union of the parts of sufficient strength to resist the pressure of the steam at fifty pounds to the square inch.

August 7.—Wind from the S. S. W. Fog continued; the workmen had not as yet completed the attachment.

August 9.—Barometer 30.30 inches at 12 M. Dry-bulb thermometer 74° F.; wet bulb 71°.5. Wind S. S. W. Fog dense along the south coast, but light over all the northern portion of the island. The echo was heard all day, not very loudly, but distinctly. Siren still horizontal, the arrangement for elevating it not having been, at 10 a. m., completed. Experiments were made on the reciprocal sounds of the whistles from two steamers, the results to be given hereafter. At 5 P. M. the adjustment of the flexible tube to the smaller end of the trumpet was finished, which, giving an additional length to the instrument of about 5 feet, threw it out of unison with the siren proper. To restore this unison the speed of revolution of the perforated plate was diminished, and after this the trumpet, still being horizontal, was sounded. An echo similar in

character to those which had been observed on the preceding day, and the earlier part of the same day, was produced.

August 10.—Barometer 30.10 inches. Dry bulb 74°; wet bulb 69° F. Wind W. S. W.; atmosphere hazy. Observations first made with the trumpet horizontal. Echo as that of preceding days, distinct but not very loud, and coming principally from the portion of the horizon in the direction of the axis of the trumpet. The position of the trumpet was then changed, its axis being turned to the zenith in order to make what was thought might be a crucial experiment. When the trumpet was now sounded a much louder echo was produced than that which was heard with the axis of the trumpet horizontal, and it appeared to encircle the whole horizon; but though special attention was directed to the point by all the party present, no reverberation was heard from the zenith. The echo appeared however to be more regular and prolonged from the ocean portion of the horizon than from that of the land.

In this experiment, while there was no reflection from the zenith in which the sonorous impulse was strongest, there must have been reverberations from the surface of the land and the ocean. This will be evident when we consider the great divergency of sound by which sonorous waves from a vertical trumpet are thrown down to the plane of the horizon on every side, some of which, meeting oblique surfaces, must be reflected back to the ear of the observer near the source of the sound. This inference will be more evident when it is recollected that the reflected rays of sound diverge as well as those of the original impulse. Hence reflection from the surface of the sea is a true cause of the echo, but whether it be a sufficient one may require further investigation. For this explanation it is not necessary that the sea should be covered with crested waves; a similar effect would take place were the surface perfectly smooth but in the form of wide swells, which in places exposed to an open sea are scarcely ever absent. Moreover, the increased loudness of the echo is a fact in accordance with the same view.

The observations were repeated with the same effect on succeeding days, until this class of experiments was ended by the bursting of the India-rubber tube. Had a distinct echo been heard from the zenith, the result would have been decidedly in favor of the hypothesis of a reflection from the air; but as this was not the case the question still remained undetermined, especially since the atmosphere during these experiments was evidently in a homogeneous condition. We do not agree however in the position taken in the report of the Trinity Board, that on the origin of this echo depends the whole solution of the problem as to the efficient cause of the abnormal phenomena of sound. The ingenious experimental illustrations of the reflection of sound from a flame or heated air, establish clearly the possibility of such reflection; but it must be remembered they were made under exaggerated conditions, the atmosphere being in a state of extreme rarefaction in a limited space, and the

sound of a feeble character, while the phenomena in nature are produced with a comparatively small difference of temperature and with powerful sounds.

Experiments at Block Island

relative to the effect of elevation on audibility.

For this investigation the first-order light-house at Block Island offered peculiar facilities. It is situated near the edge of a perpendicular bluff, 152 feet above the sea. The tower being 52 feet above the base, gives a total height to the focal plane of the lens of 204 feet, on the level of which the ear of the observer could be placed.

The first and second experiments of this class were made on the 10th of August, with two light-house steamers, the Putnam and the Mistletoe, moving simultaneously in opposite directions. The barometer indicated 30.10 inches of atmospheric pressure; the dry-bulb thermometer indicating 74° F., and the wet-bulb 69°. The wind at the time of the experiments was from the west, and of a velocity of seven miles per hour. The vessels started from the point C, Fig. 4, opposite the light-house, A, about one mile distant, a position as near the shore as it was considered safe to venture. The Putnam steamed with the wind, the Mistletoe steamed against the wind, each blowing its whistle every half minute. The duration of the sound was noted at the top of the tower and at the level of the sea, Mr. Brown being the observer at the latter station, while the chairman of the board, with an assistant, observed at the former. On comparing notes, the watches having been previously set to the same time, it was found—

First. That the duration of the sound on the tower, when coming against the wind, was nine minutes, while at the base of the cliff it was heard only one minute. It was afterward found from the records on board of the Putnam, the sound of which came against the wind, that this vessel was moving, during the experiment, at half-speed, and hence the duration of the sound on the tower should be considered as $4\frac{1}{2}$ minutes, and the difference in favor of audition on the tower 4 minutes instead of 8, as given by the first record.

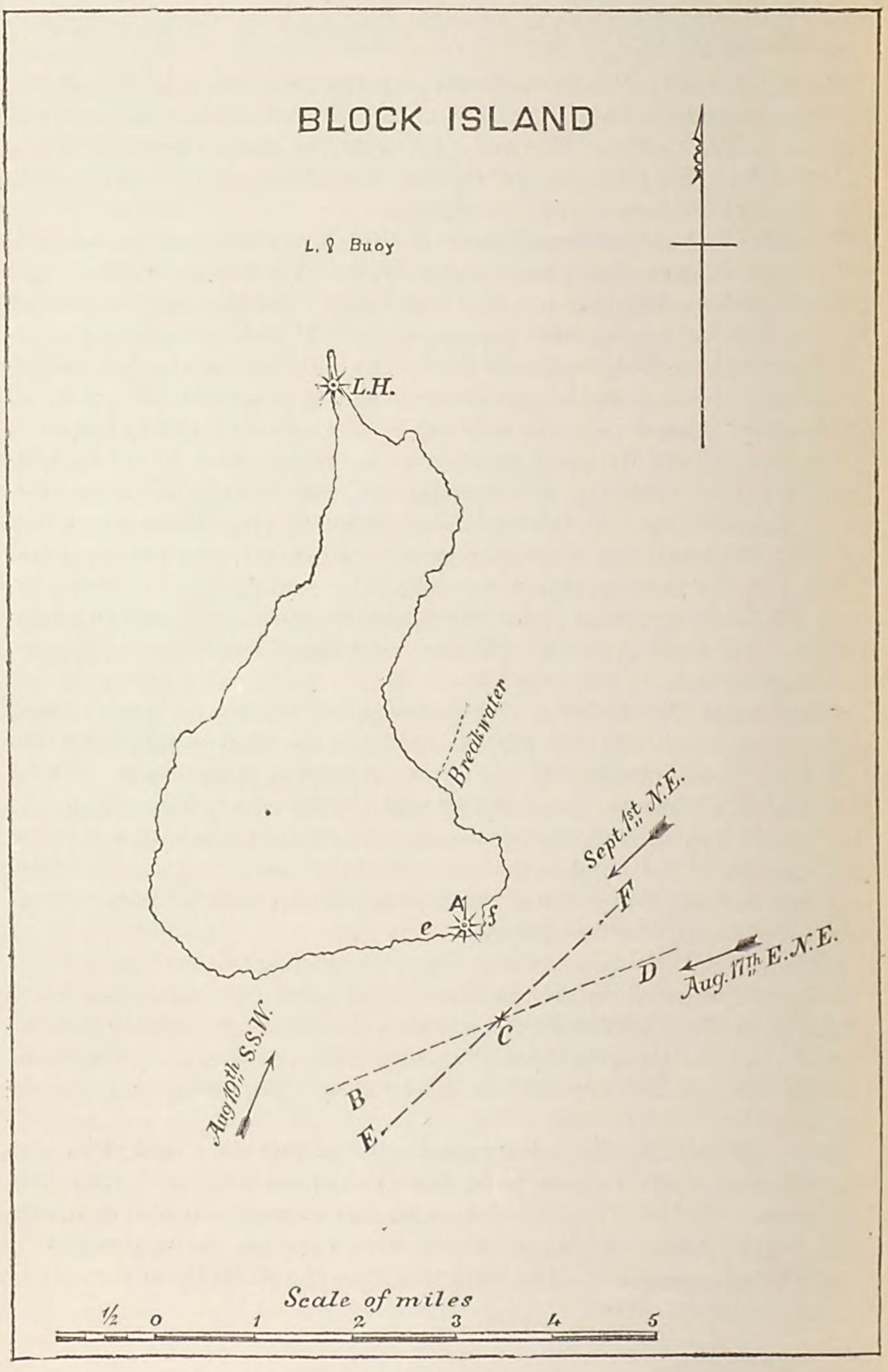
Second. That the sound of the Mistletoe, coming to the observer with the wind, was heard on the tower during 15 minutes, while it was heard at the base of the cliff during 34 minutes, the difference being 19 minutes in favor of hearing at the level of the sea. This result, which differs from that of all the other experiments of the same class, deserves special attention.

After making the foregoing experiments of this class, and others, on the effect of wind on sound, to be described in the next section, the vessels were called off for other duty, and the investigations were not resumed until August 17, when the following experiments were made:

The third experiment.—The wind was from the E. N. E., at the rate of

about five miles per hour at the surface, and a greater velocity at the height of the tower. Barometer, 30.25 ins.; thermometer, 72°.

Fig. 4.



In this and the subsequent experiments of the same day but one steamer—the Mistletoe—was employed. It started at 10:30 A. M. from the point C, Fig. 4, at the foot of the cliff, and steamed W. S. W. along C B for about 12 minutes, or a distance of two miles, blowing the whistle every half-minute. To note the duration of the sound, Dr. Welling was stationed at the foot of the cliff, at the level of the sea, while the chairman of the Light-House Board, with an assistant who acted as clerk, was on the upper gallery of the tower, the ears of the latter being almost precisely 200 feet above those of the observer at the foot of the cliff.

The watches having been previously set to the same time, on comparing results it was found that the whistle was heard at the top of the tower for twelve minutes and at the bottom of the cliff for five and one-half minutes, making the difference in favor of audition on the tower six and one-half minutes. In this experiment the sound came to the observers nearly against the wind.

The *fourth experiment* consisted in directing the Mistletoe to proceed in the opposite direction from the same point, along the line C D. It started at 11:5 A. M. the breeze being light at the time, and proceeded about two and one-half miles before the sound was lost to the observers. On comparing notes it was found that the sound was heard at the top of the tower during fifteen minutes, and at the level of the sea for eleven minutes, giving a difference in favor of the hearing on the top of the tower of four minutes.

In the *fifth experiment*, the Mistletoe steamed again in the direction with the wind, the sound from its whistle coming to the ears of the observers against the wind. Starting about 11:45 A. M. and steaming about two miles, the sound was heard on the tower during twelve minutes and at the foot of the cliff during five and one-half minutes, making a difference of six and a half minutes in favor of audition on the tower. Previous to this experiment the wind had veered one point to the west, bringing the direction of the sound to the observers in less direct opposition to the wind than in the last experiment.

The sixth experiment.—In this case the steamer was directed to proceed in the opposite direction, or against the wind, so that the sound of the whistle would reach the ear of the observers in the same direction as that of the wind. It started at 12:19 P. M. and proceeded two and one-sixth miles; the whistle was heard during thirteen minutes on the top of the tower, and at the bottom of the cliff during precisely the same time, the difference between the top of the tower and the bottom of the cliff in this case being nothing.

The vessel having again been called off on other duty the *seventh experiment* was made the 1st of September. On this day the wind was northeast; the velocity at the top of the tower was thirteen and a half miles per hour, and at the bottom of the tower eleven miles per hour. The barometer indicated 30.20 inches pressure, the dry bulb 72°, and the wet bulb 67½°.

The theoretical conditions for exhibiting the effect of height on audition in this experiment were much more favorable than any of the preceding. First, the velocity of the wind was greater; second, the difference between the velocities at top and bottom of the tower was well marked, and the direction of the wind was more favorable for direct opposition to the sound as it came to the ear of the observer. In this case General Woodruff was the observer at the bottom of the cliff, while the chairman of the Light-House Board and his assistant, with several visitors, were at the top of the tower.

The steamer started at 10:58 A. M. and proceeded during eight minutes, or a mile and one-third, when the sound was lost at the top of the tower. In this case, though the sound was heard for eight minutes from the top of the tower, and the first five blasts marked on the notes as quite loud, it was not heard at all at the bottom of the cliff at least a hundred yards nearer the source of the sound.

This result, which interested and surprised a number of intelligent visitors, who were in the tower at the time, strikingly illustrates the effect of elevation on the audibility of sound moving against the wind. The result was so important that it was thought advisable to immediately repeat the experiment under the same conditions.

In the *eighth experiment*, the Mistletoe was again directed to proceed, in the direction of the wind, along the line it had previously traversed. It started at 11:25 A. M., and proceeded during six minutes, or one mile, when the sound was lost at the top of the tower. In this case, the first blast of the whistle was feebly heard at the base of the cliff, but no other, while thirteen blasts were heard at the top of the tower, of which the first six were marked as loud.

That this remarkable effect was not produced by an acoustic cloud or a flocculent atmosphere is evident from the experiment which immediately succeeded.

The ninth experiment.—In this trial, the Mistletoe was directed to proceed against the wind, so that the sound of its whistle should come to the ears of the observers with the wind. It started at 11:48 A. M., and proceeded during sixteen minutes, or two and two-thirds miles, when the sound of its whistle was lost to the observers on the top of the tower. In this case the sound of the whistle became audible at the bottom of the cliff as soon as the position of the vessel became such as to bring the sound to the observers approximately with the wind, and continued to be audible during fifteen minutes, or within one minute as long as the sound was heard at the top of the tower.

It may be mentioned as an interesting fact, that an assistant who was observing the sound with General Woodruff at the foot of the cliff, when the sound could not be heard at the level of the sea, in the sixth experiment perceived it distinctly by ascending the side of the cliff to a height of twenty-five or thirty feet.

All the conditions and results of these experiments are strikingly in

conformity with the theory of the refraction of sound which we have previously explained.

The following recapitulation of the results of the foregoing experiments will exhibit their correspondence with the general theory:

Sound heard coming against the wind.

Experiments.	Duration at the top of the tower.	Duration at the base of the cliff.	Difference in favor of audition on the tower.
First	4½ minutes	½ minute	4 minutes.
Third	12 minutes	5½ minutes	6½ minutes.
Fifth	12 minutes	5½ minutes	6½ minutes.
Seventh	8 minutes	Not heard	8 minutes.
Eighth	6 minutes	First blast heard, but no other, ½ minute after starting.	5½ minutes.
	42½ minutes	12 minutes.	30½ minutes.
Average	8½ minutes	2.4 minutes	6.1 minutes.

Sound heard coming with the wind.

Experiments.	Duration at the top of the tower.	Duration at the base of the cliff.	Difference in favor of audition at base of cliff.
Second	15 minutes	34 minutes	19 minutes.
Fourth	15 minutes	11 minutes	— 4 minutes.
Sixth	13 minutes	13 minutes	0 minutes.
Ninth	16 minutes	15 minutes	— 1 minute.
	59 minutes	73 minutes	14 minutes.
Average	14¾ minutes	18¼ minutes	3½ minutes.

From the first of the foregoing tables it appears that the elevation of the observer has a marked effect on the audition of sound moving against the wind while, from the second, with one important exception, it has very little, if any, effect on sound moving with the wind. Another experiment relative to the same class of phenomena was made on the 19th of August (see Fig. 4), the wind being S. S. W. Two observers, General Woodruff and Dr. Welling, starting from the bottom of the cliff immediately below the light-house, went along the beach, the one in the direction A *f*, and the other in direction A *e*. General Woodruff found that the sound of the siren was distinctly heard all the way to the breakwater, and was so loud that it probably could have been heard for several miles in that direction. Dr. Welling, on the contrary, entirely lost the sound within a quarter of a mile of the light-house. This result is readily explained as a case of lateral refraction; the wind was in the direction traversed by General Woodruff, and contrary to that pursued by Dr. Welling. In the one case the wind, retarded by the surface of

the cliff, moved with less velocity than it did farther out, and consequently the sound was thrown against the face of the cliff, and on the ear of the observer, and in the other thrown from it, thus leaving, as it were, a vacuum of sound. The effect in the case was very striking, since the siren was pointed toward the zenith, and the sound in still air could have been heard for miles in every direction.

Investigations at Block Island

IN REGARD TO THE EFFECT OF WIND ON AUDIBILITY.

These were made by the aid of two steamers. Captain Walker, naval secretary of the board, having completed a series of inspections in the Third District, sent the steamer Putnam, under Captain Fields, to aid the Mistletoe in the investigations. They were commenced on the 9th of August, at 12 o'clock. The wind was S. S. W. with a velocity of $7\frac{1}{4}$ miles per hour. Barometer, 30.3 inches; thermometer, dry bulb, 74° F. wet bulb, $71\frac{1}{2}$° F.

The two steamers started from a buoy near the north end of the island, the one steaming against the wind, and the other with it, each blowing its whistle every minute. The distance travelled by each steamer was estimated by the running time, which, from previous observations, was found to be ten miles per hour. Each vessel was furnished with a whistle of the same size, of 6 inches diameter, actuated by the same pressure of 20 pounds of steam, and which, by previous comparison, had been found to give sound at this pressure of the same penetrating power. The observations on the Mistletoe were made by General Woodruff, and on the Putnam by Dr. Welling, each assisted by the officers of the respective vessels. The two steamers proceeded to buoy off the north end of the island, in which position the wind was unobstructed by the land—a low beach. Indeed, the island being entirely destitute of trees, and consisting of a rolling surface, the wind had full sweep over it in every direction.

First experiment.—The Putnam went against the wind and the Mistletoe in the opposite direction. The Putnam lost the sound of the whistle of the Mistletoe in two minutes and stopped, but continued to blow the whistle. The Mistletoe continued on her course and heard the Putnam's whistle for twenty minutes in all. During the first two minutes both vessels were in motion, and therefore the space through which the sound was heard moving against the wind would be represented by 4, while the space through which the sound was heard moving with the wind would be represented by $20 + 2 = (22)$, the ratio being $1 : 5\frac{1}{2}$.

Second experiment.—In this the Putnam went with the wind and the Mistletoe in the opposite direction. The Mistletoe lost the sound of the Putnam's whistle in two minutes. The Putnam then stopped and remained at rest, while the Mistletoe continued on her course until the Putnam lost sound of her whistle, twenty-six minutes later. As both steamers were separating during the first two minutes with equal speed,

the distance travelled by the sound heard moving against the wind is represented by 4, while the distance of the sound heard with the wind is represented by $26 + 2 = 28$, the ratio being 1 : 7. It should be mentioned, however, that the notes in this experiment are defective and somewhat discrepant.

Third experiment.—The Putnam went against the wind, the Mistletoe in the opposite direction. The Putnam lost the sound of the whistle of the Mistletoe in two minutes, while the Mistletoe continued to hear the whistle of the Putnam ten minutes longer. Owing to a misunderstanding, one of the steamers stopped for two minutes and then resumed its course. As both steamers were separating during the first two minutes with equal speed, the distance of the sound heard moving against the wind is represented by 4, while the sound heard with the wind through a space denoted by $2 \times 10 + 4 - 2 = 22$, the ratio being 1 : 5½.

Fourth experiment.—The vessels again changed directions, the Putnam going with the wind, and the Mistletoe in the opposite direction. The Mistletoe lost the sound in two minutes, and the Putnam nine minutes later. As each steamer was moving from the other at the same rate, the distance of the sound heard moving against the wind would be represented by 4, while the distance of the sound moving with the wind would be represented by $9 \times 2 + 4 = 22$, the ratio being again 1 : 5½.

Fifth experiment.—This experiment was made August 10, by the same vessels and same observers, wind W. S. W., of about the same intensity as on previous days; barometer, 30.1 ins.; dry bulb, 74° F. wet bulb, 69°. The Putnam steamed against the wind, and the Mistletoe in the opposite direction. The Putnam lost the sound in two minutes, and the Mistletoe nine minutes later. The two vessels moving apart with equal velocity, the space traversed by the sound moving against the wind was represented by 4, while that in the opposite direction was represented by 22, viz, $9 \times 2 + 4 = 22$.

Sixth experiment.—The vessels were next separated in a direction at right angles to the wind, when each reciprocally lost the sound of the other on an average of six minutes, giving a distance travelled by the sound, while audible, of twelve spaces.

Seventh experiment.—The vessels were next directed along an intermediate course between the direction of the wind and a line at right angles to it, with the following results: The Mistletoe, against the wind, lost the sound in about two minutes, while the Putnam heard the sound seven minutes longer. As in the previous case, the two vessels moving apart with equal velocity would in two minutes be separated by a space represented by 4, which would indicate the audibility of the sound moving against the wind, and for the same reason the other vessel, hearing the sound seven minutes longer, would have the additional space represented by 14, and adding to this four spaces, we have 18 to represent the audibility of the sound in the direction approximating that of the wind.

The following table exhibits at one view the results of the foregoing experiments, which relate to sound moving against the wind, and with the wind, reduced to miles.

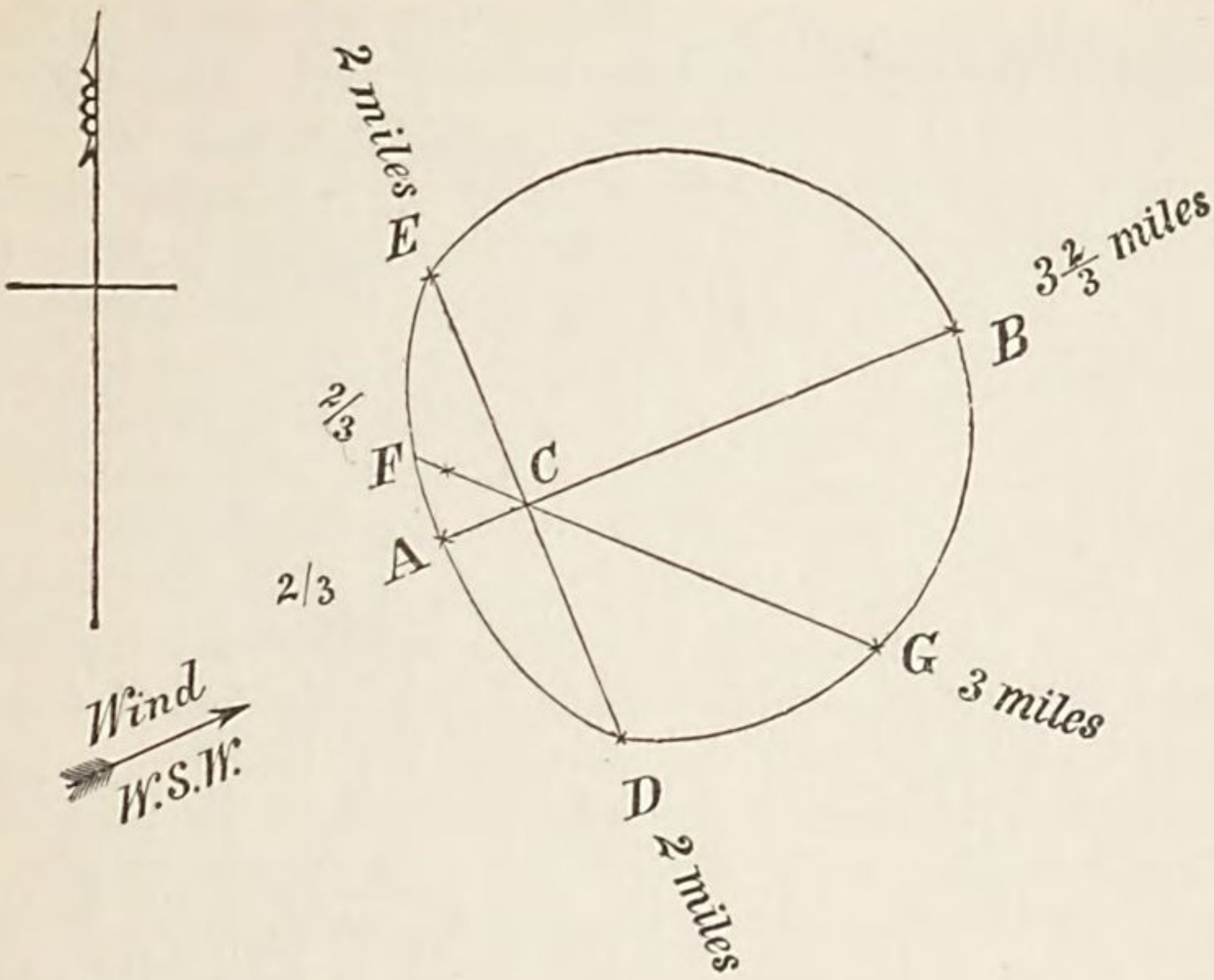
Experiment.	Sound with the wind.	Sound against wind.
	Miles.	*Miles.*
1	3. 66	0.66
2	4. 66	0.66
3	3. 66	0.66
4	3. 66	0.66
5	3. 66	0.66

These results are in accordance with those of all the direct observations which had previously been made on sound in regard to wind by the Light-House Board, with the exception of those at Sandy Hook in September, 1874, as given in the last report, in which the sound was heard from a steamer farther against the wind than in the direction of the wind. This anomaly was explained by the existence of an upper current of air, moving in an opposite direction to that at the surface, in accordance with the hypothesis of the refraction of sound.

It will be observed that four of the experiments give exactly the same distances to represent the audibility of sound with and against the wind. This coincidence was not observed until after the notes were collated for discussion, and, if not accidental, was due to the equal velocity of the wind and the general conditions of the atmosphere on the two days.

To give a definite idea of these relations we have plotted the results obtained on August 10, in Fig. 5, converting the distances into miles and referring them to a common center, and tracing through the several extremities of the lines representing the distances a continuous line, which may be designated as the curve of audibility. C being the center to which the sounds are referred, C A represents the distance at which the sound was heard against the wind, and C B in the direction of the wind, while C E and C D represent the distance at right angles to the wind, and F C and C G the distances respectively with and against the wind on an intermediate course.

FIG. 5.



The curve which is presented in the foregoing figure may be considered as that which represents the normal limit of audibility during the two days in which the experiments were made. The line D E divides the plane of the curve into two unequal portions, D A F E and D G B E, the former representing the audibility of sound moving against the wind, and the other the audibility of sound moving with the wind.

We can scarcely think that any other condition of the air than that of its motion could produce a result of this kind. It exhibits clearly the fact that sound is not heard as a general rule at right angles to the wind farther than with the wind, as has been asserted. In this case the ratio of the latter to the former is as 11 to 6, or nearly double.

The investigation of the relation of wind to the penetration of sound was renewed in a series of subsequent experiments, the results of which are to be given in a succeeding part of this report.

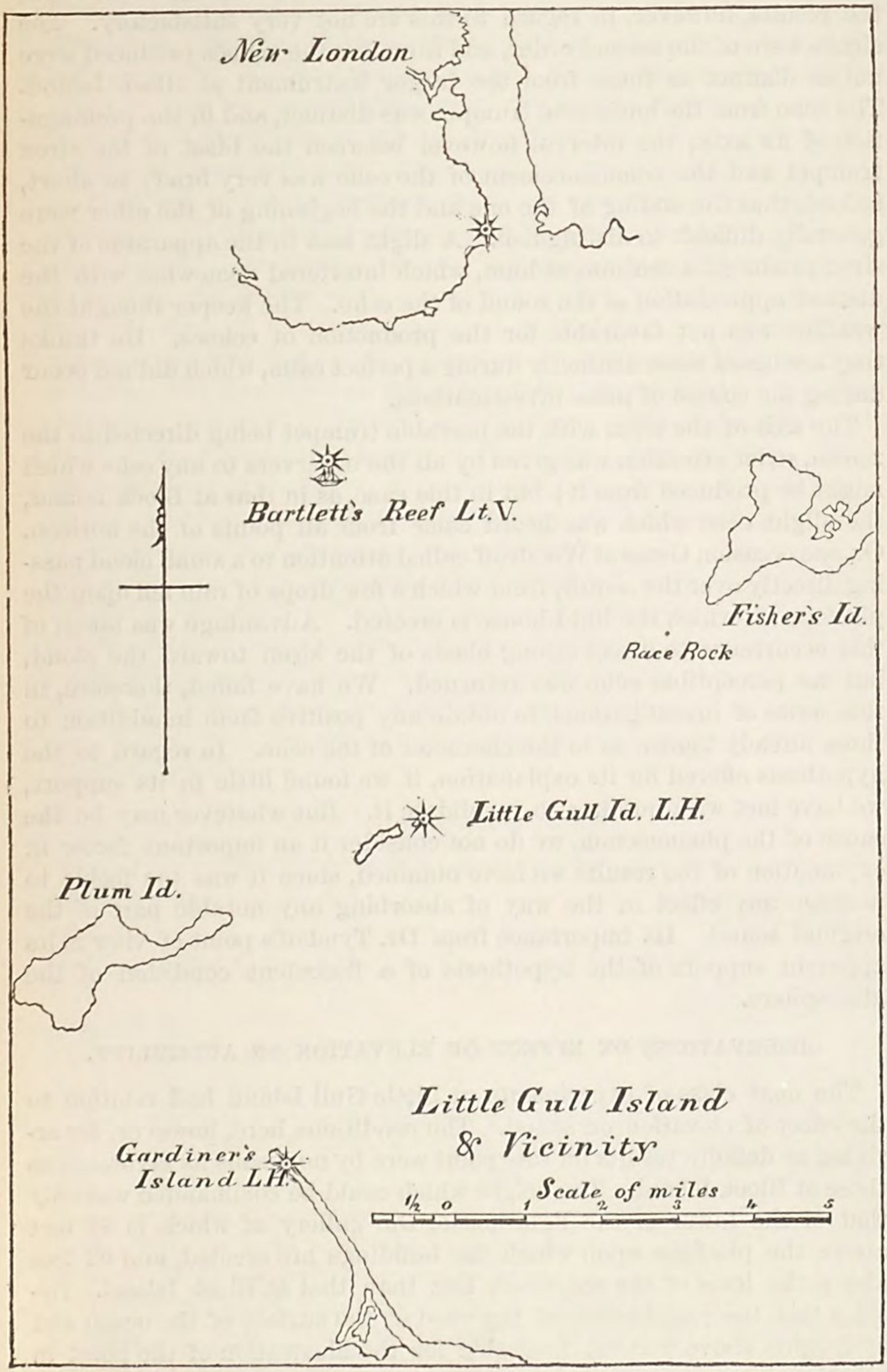
It should be observed, in comparing Fig. 5 with the subsequent figures representing the curve of audibility, that the arrow representing the direction of the wind points in the longest direction to the figure, whereas in other figures the pointing is in the opposite direction. The difference arises from the fact that in Fig. 5 the sound is supposed to radiate from the center, C, while in the others the sound converges to the center as a point of observation. The foregoing diagram and all that follow in this report were plotted by Mr. Edward Woodruff, assistant superintendent of construction of the third light-house district.

Experiments at Little Gull Island, September, 1875.

The next series of experiments made during this season was at Little Gull Island, at the east end of Lond Island Sound. This location was chosen on account of its convenience of approach from the harbor of New London, seven miles distant, at which the light-house steamers of the third district usually remain when not engaged in active service, and also because there is a light-house on the island furnished with two sirens of the second order, and an extent of water on every side which would allow the vessels used in the experiments to proceed from the island as a center to a considerable distance in every direction. The island itself is a small protuberance above the water, merely sufficient in area to support a raised circular platform of about 100 feet in diameter, on which the light-house and other buildings are erected. The following sketch (Fig 6) will give an idea of the position of Gull Island relative to the main-land and the islands in the vicinity.

From this it will be seen that the position was not the most favorable for a stable condition of the atmosphere. As the heat of the sun increases during the first part of the day, the temperature of the land rises above that of the sea; and this excess of temperature produces upward currents of air, disturbing the general flow of wind both at the surface of the sea and at an elevation above. But although the locality was unfavorable for obtaining results tending to exhibit the effects of broad currents of wind flowing in one direction, it had the advantage of offering more varied phenomena than could otherwise have been exhibited. Before commencing the experiments, directions were given to attach a rotating iron neck to the trumpet of one of the sirens, in order that it might be directed to the zenith; while the other siren remained with its axis in a horizontal direction. The observers in these investigations consisted of the chairman of the board; General Woodruff, engineer third district; Porter Barnard, assistant superintendent of construction; Captain Keeney, and other officers of the Mistletoe; with an assistant who acted as one of the observers and recording clerk. The Mistletoe was daily employed, though on two occasions the Cactus, another of the light-house steamers, rendered assistance.

Fig. 6.


New London
Bartlett's Reef Lt.V.
Fisher's Id.
Race Rock
Little Gull Id. L.H.
Plum Id.
Little Gull Island
& Vicinity
Gardiner's Island LH.
Scale of miles
½ 0 1 2 3 4 5

OBSERVATIONS ON THE ECHO AT LITTLE GULL ISLAND.

The first observations to be mentioned are those relating to the echo; the results, however, in regard to this are not very satisfactory. The sirens were of the second order, and therefore the echoes produced were not as distinct as those from the larger instrument at Block Island. The echo from the horizontal trumpet was distinct, and in the prolongation of its axis; the interval however between the blast of the siren trumpet and the commencement of the echo was very brief; so short, indeed, that the ending of the one and the beginning of the other were generally difficult to distinguish. A slight leak in the apparatus of the siren produced a continuous hum, which interfered somewhat with the distinct appreciation of the sound of the echo. The keeper thought the weather was not favorable for the production of echoes. He thinks they are heard most distinctly during a perfect calm, which did not occur during the course of these investigations.

The axis of the siren with the movable trumpet being directed to the zenith, strict attention was given by all the observers to any echo which might be produced from it; but in this case, as in that at Block Island, the slight echo which was heard came from all points of the horizon. On one occasion General Woodruff called attention to a small cloud passing directly over the zenith, from which a few drops of rain fell upon the platform on which the light-house is erected. Advantage was taken of this occurrence to direct strong blasts of the siren toward the cloud, but no perceptible echo was returned. We have failed, therefore, in this series of investigations, to obtain any positive facts in addition to those already known as to the character of the echo. In regard to the hypothesis offered for its explanation, if we found little in its support, we have met with nothing to invalidate it. But whatever may be the cause of the phenomenon, we do not consider it an important factor in explanation of the results we have obtained, since it was too feeble to produce any effect in the way of absorbing any notable part of the original sound. Its importance from Dr. Tyndall's point of view is its apparent support of the hypothesis of a flocculent condition of the atmosphere.

OBSERVATIONS ON EFFECT OF ELEVATION ON AUDIBILITY.

The next class of experiments at Little Gull Island had relation to the effect of elevation on sound. The conditions here, however, for arriving at definite results on this point were by no means as favorable as those at Block Island. The height which could be commanded was only that of the tower of the light-house, the gallery of which is 74 feet above the platform upon which the buildings are erected, and 92 feet above the level of the sea, much less than that at Block Island. Besides this, the variableness of the wind at the surface of the ocean and at heights above was not favorable for the illustration of the point in question.

The theoretical conditions in order that the sound may be heard with greater distinctness at an elevation than below are, as we have said before, that the wind be moving with a greater velocity in a given direction at an elevation than at the surface of the earth, and that the difference in the velocities may be against the sound-wave, so that its upper part may be more retarded than the lower. In this case the direction of a beam of sound will be curved upward, leaving as it were a vacuum of sound beneath. The distance of the origin of sound, however, must not be too great relatively to the elevation of the observer; otherwise it will pass over his head, as well as over that of the observer at the surface of the earth. In most instances the sound was not continuous, but was interrupted—heard for a time, then lost; again becoming audible, it was heard until it finally became imperceptible. Besides this, it was difficult to determine when the sound ceased to be heard, since this depended on the sensibility of the ear and the greater or less attention of the observer at the time of the observation. To obviate these difficulties as well as the unfavorable condition of too great a distance of the origin of sound from the observer, it was concluded to adopt as the duration of the sound the elapsed time between its beginning and the period when it was first lost.

The observer on the tower was Mr. P. Barnard, while the one below was General Woodruff. From the records of the observations of these gentlemen the following tables are compiled, the first of which indicates the relative duration of sound on the top of the tower and at the bottom, the sound moving against the wind; the second, the same duration, the sound moving with the wind; and the third, the same with the sound at right angles to it.

TABLE 1.—*Sound against the wind.*

Date.	Heard at top of tower.		Heard at bottom.	
1875.	*min.*	*sec.*	*min.*	*sec.*
September 2	5	30	4	00
4	4	30	3	30
4	5	30	3	00
4	5	00	4	00
6	7	00	2	15
6	4	00	3	00
7	5	00	2	15
8	6	00	4	00
8	5	30	3	45
8	3	30	2	15
8	3	00	1	15
Mean	4	57	3	01

It appears from Table 1 that without a single exception the duration of the sound was greater at the top of the tower than at the bottom, although the difference in favor of the top of the tower in the several experiments is very variable. These results are in accordance with what was anticipated.

TABLE 2.—*Sound with the wind.*

Date.	Heard at top of tower.		Heard at foot of tower.	
	min.	*sec.*	*min.*	*sec.*
September 2	30	00	30	00
3	16	30	18	00
4	21	00	20	30
4	18	00	23	30
6	12	30	12	30
7	6	30	5	30
Mean	17	25	18	20

In these observations the duration of the sound at the bottom and top are nearly the same, from which we might infer that the elevation of the observer has little effect on the hearing of sound moving with the wind. Were it not for the result of the first experiment of this class at Block Island, we should not hesitate to adopt this as a general conclusion.

TABLE 3—*Sound heard nearly at right angles to the wind.*

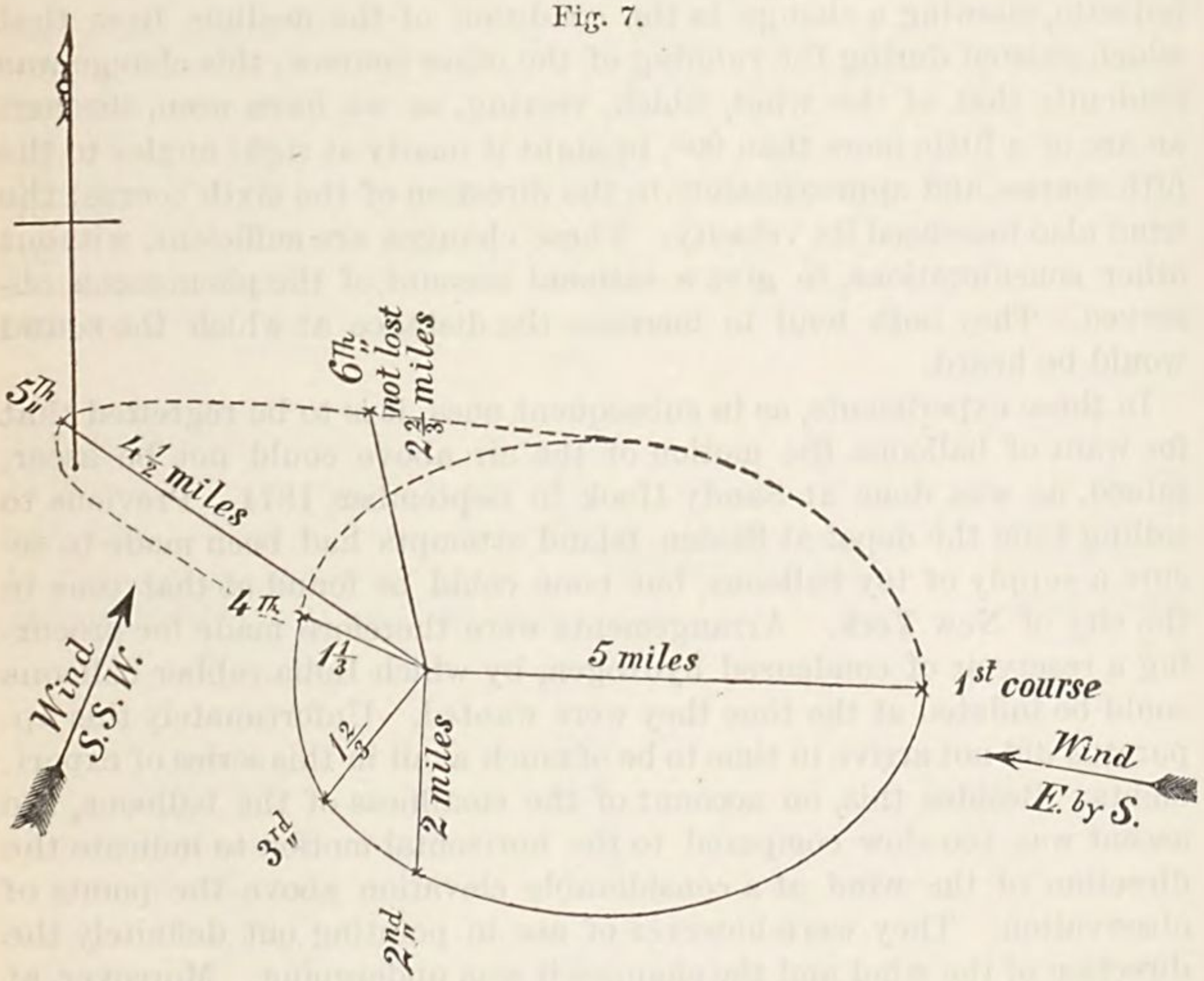
Date.	Heard at top of tower.		Heard at foot of tower.	
	min.	*sec.*	*min.*	*sec.*
September 2	6	00	4	00
2	6	45	10	00
2	25	00	23	00
2	16	30	4	00
3	21	00	19	15
3	16	00	14	30
3	23	30	16	45
4	19	30	17	30
6	6	30	5	30
7	5	00	6	45
7	12	00	12	30
8	4	15	3	15
8	9	30	5	00
Mean	13	12	10	55

From the result of this table it would appear that the sound can be heard moving at right angles to the wind better at an elevation that at the surface—a result not anticipated.

OBSERVATIONS ON THE EFFECT OF WIND ON SOUND.

This series was commenced on the 2d of September. Barometer, 30.3 inches; thermometer, dry-bulb, 70°.5 F. wet-bulb, 67°.5. Wind at the surface of sea was six miles per hour, and variable; at 3 p. m. the velocity was eight miles at the surface. (See Fig. 7.)

Fig. 7.



The experiments were made by means of the steamer Mistletoe, which proceeded from the light-house, as a center, in different directions, blowing the whistle every half-minute, and returning when, from a signal, the sound was lost; the time being noted by different observers, and the distance estimated by the position of the steamer in reference to known objects on the Coast-Survey chart, as well as by angles of azimuth and time of sailing. The steamer was directed to proceed, as indicated in Fig. 7, 1st, against the wind, so that the sound would come to the observers with the wind; 2d, at right angles to the wind; 3d, in an intermediate direction between the last course and the direction of the wind; 4th, approximately with the wind, so that the sound would come to the ears of the observers against the wind; 5th, in an intermediate direction; and, 6th, again at right angles to the wind. It was

supposed that by this arrangement a symmetrical curve of sound would be obtained; and we think this would have been the case had the wind remained constant in direction. It did remain nearly the same during the time of describing the first, second, and third courses, and only slightly varied during the fourth; but previous to running the fifth and sixth courses the wind had changed to a direction nearly at right angles to its first course.

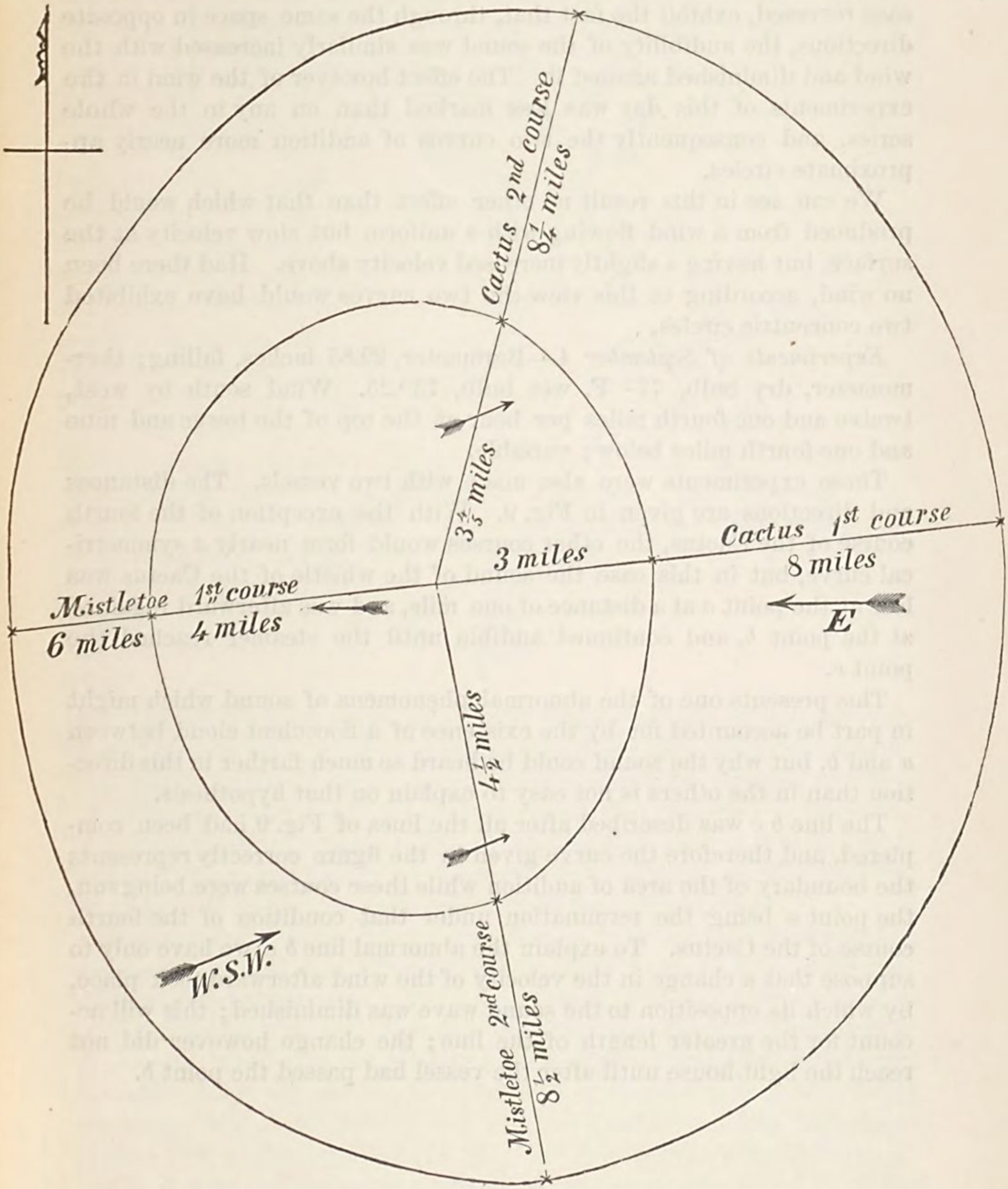
As is shown in Fig. 7, the first, second, third, and fourth courses form a normal curve of audition; the fifth and sixth courses, however, give discordant results, being much longer than a symmetrical curve would indicate, showing a change in the condition of the medium from that which existed during the running of the other courses; this change was evidently that of the wind, which, veering, as we have seen, through an arc of a little more than 90°, brought it nearly at right angles to the fifth course, and approximately in the direction of the sixth course; the wind also increased its velocity. These changes are sufficient, without other considerations, to give a rational account of the phenomena observed. They both tend to increase the distance at which the sound would be heard.

In these experiments, as in subsequent ones, it is to be regretted that for want of balloons the motion of the air above could not be ascertained, as was done at Sandy Hook in September, 1874. Previous to sailing from the depot at Staten Island attempts had been made to secure a supply of toy balloons, but none could be found at that time in the city of New York. Arrangements were therefore made for procuring a reservoir of condensed hydrogen, by which India-rubber balloons could be inflated at the time they were wanted. Unfortunately this apparatus did not arrive in time to be of much avail in this series of experiments. Besides this, on account of the smallness of the balloons, the ascent was too slow compared to the horizontal motion to indicate the direction of the wind at a considerable elevation above the points of observation. They were however of use in pointing out definitely the direction of the wind and the changes it was undergoing. Moreover, at the time of leaving New York we were only able to procure one anemometer, whereas we ought to have had a number, one for the top of the tower, one for the bottom, and one for each vessel.

Experiments of September 3.—Barometer, 30.02 inches; thermometer, dry bulb, 72°.5 F. wet bulb, 70°; wind from the east, but too slight to move the cups of the anemometer; it soon however spang up from the opposite direction, in which it continued during the remainder of the day, attaining a velocity of five and a quarter miles per hour.

In these experiments two light-house steamers were employed, the Mistletoe and Cactus, which enabled us to obtain the results in half the time, and thus to obviate the effect, in some degree, of any change in the direction of the wind. On this occasion the sound was noted at the light-house as it converged to a center from the whistle of each vessel,

Fig. 8.


Cactus 2nd course
8½ miles
3¼ miles
3 miles
Cactus 1st course
8 miles
E
Mistletoe 1st course
4 miles
6 miles
4½ miles
W.S.W.
2nd course
Mistletoe
8½ miles

and also simultaneously by each vessel as it diverged from the vertical siren.

We were enabled, in this way, to produce two curves by a reverse process. These are plotted in Fig. 8, and exhibit a remarkable degree of similarity. The corresponding parts of the two curves, being in each case reversed, exhibit the fact that, through the same space in opposite directions, the audibility of the sound was similarly increased with the wind and diminished against it. The effect however of the wind in the experiments of this day was less marked than on any in the whole series, and consequently the two curves of audition more nearly approximate circles.

We can see in this result no other effect than that which would be produced from a wind flowing with a uniform but slow velocity at the surface, but having a slightly increased velocity above. Had there been no wind, according to this view the two curves would have exhibited two concentric circles.

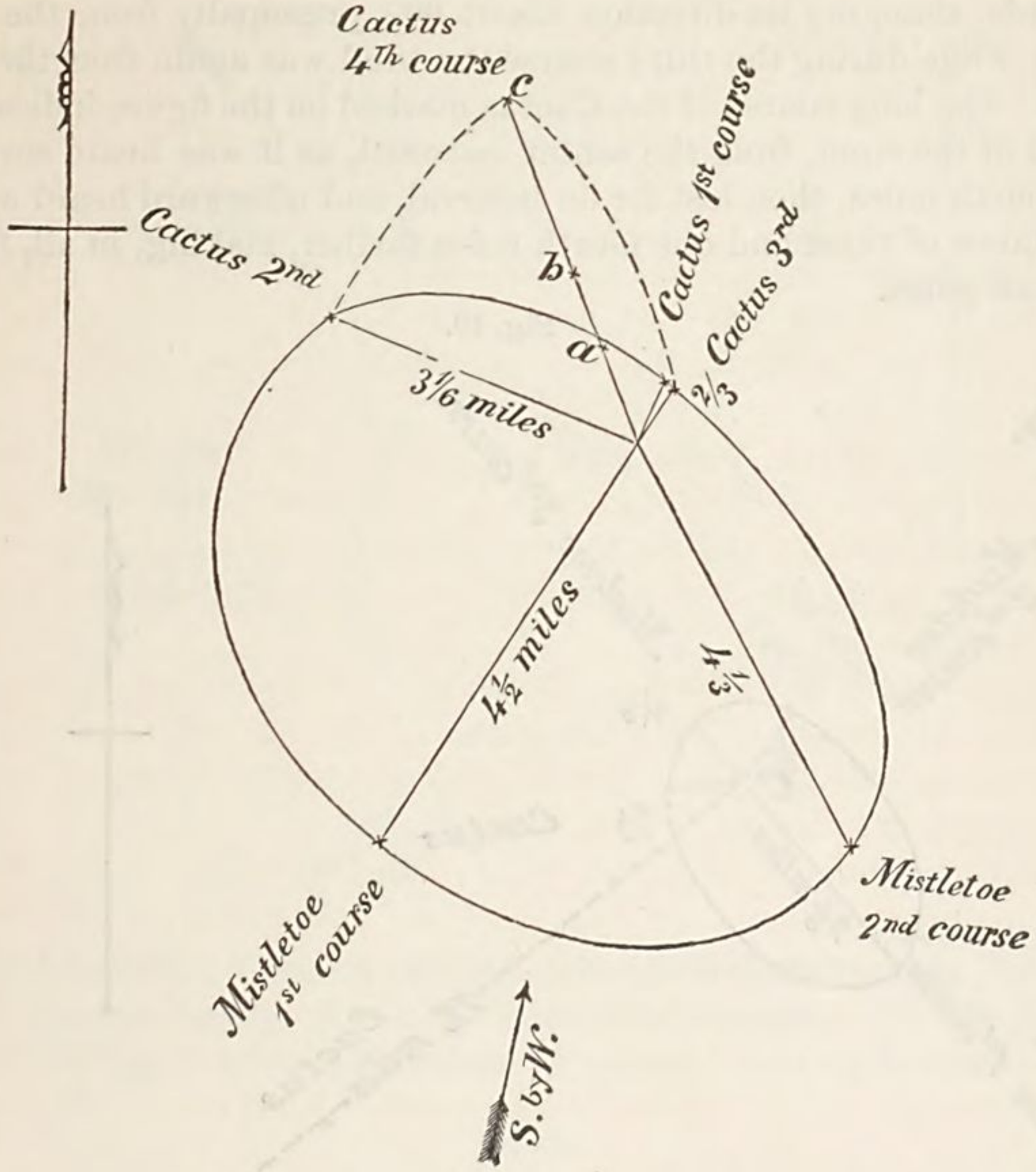
Experiments of September 4.—Barometer, 29.85 inches, falling; thermometer, dry bulb, 77° F. wet bulb, 73°.25. Wind south by west, twelve and one-fourth miles per hour at the top of the tower and nine and one-fourth miles below; variable.

These experiments were also made with two vessels. The distances and directions are given in Fig. 9. With the exception of the fourth course of the Cactus, the other courses would form nearly a symmetrical curve, but in this case the sound of the whistle of the Cactus was lost at the point *a* at a distance of one mile, and was afterward regained at the point *b*, and continued audible until the steamer reached the point *c*.

This presents one of the abnormal phenomena of sound which might in part be accounted for by the existence of a flocculent cloud between *a* and *b*, but why the sound could be heard so much farther in this direction than in the others is not easy to explain on that hypothesis.

The line *b c* was described after all the lines of Fig. 9 had been completed, and therefore the curve given in the figure correctly represents the boundary of the area of audition while these courses were being run, the point *a* being the termination under that condition of the fourth course of the Cactus. To explain the abnormal line *b c*, we have only to suppose that a change in the velocity of the wind afterward took place, by which its opposition to the sound-wave was diminished; this will account for the greater length of the line; the change however did not reach the light-house until after the vessel had passed the point *b*.

Fig. 9.



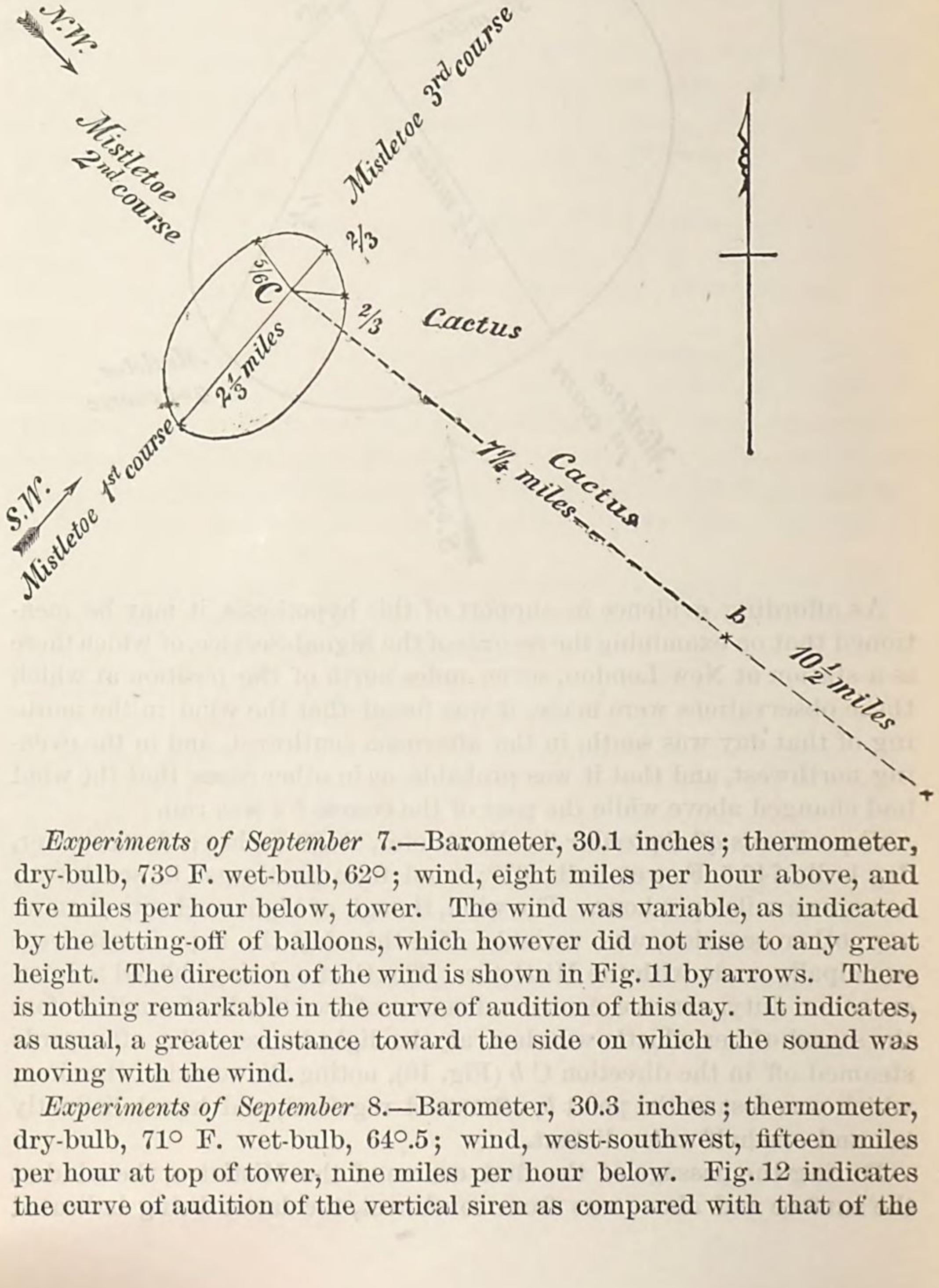
As affording evidence in support of this hypothesis, it may be mentioned that on examining the records of the Signal-Service, of which there is a station at New London, seven miles north of the position at which these observations were made, it was found that the wind in the morning of that day was south, in the afternoon southwest, and in the evening northwest, and that it was probable, as in other cases, that the wind had changed above while the part of the course *b c* was run.

Experiments of September 6.—Barometer, 29.93 inches; thermometer, dry bulb, 74°.5 F. wet bulb, 67°; wind from northwest to southwest, seventeen miles per hour. The wind, though of higher velocity than on any other occasion, was variable. On this day the experiments were principally made with the Mistletoe. The Cactus, being obliged to leave on other duty, ran one course a distance of two-thirds of a mile before the sound of her whistle was lost at the light-house. She afterwards steamed off in the direction C *b* (Fig. 10), noting the sound of the siren, which was lost at the point *b*, afterward regained, and heard distinctly ten and one-half miles distant.

During the passage of the first course of the Mistletoe, the wind at the surface and above was from southwest, the latter being indicated

by a cloud passing the zenith. During the second course the wind was variable, changing its direction about 90°, principally from the northwest; while during the third course the wind was again from the southwest. The long course of the Cactus marked on the figure indicates the sound of the siren, from the center outward, as it was heard seven and one-fourth miles, then lost for an interval, and afterward heard again at a distance of three and one-fourth miles farther, making, in all, ten and one-half miles.

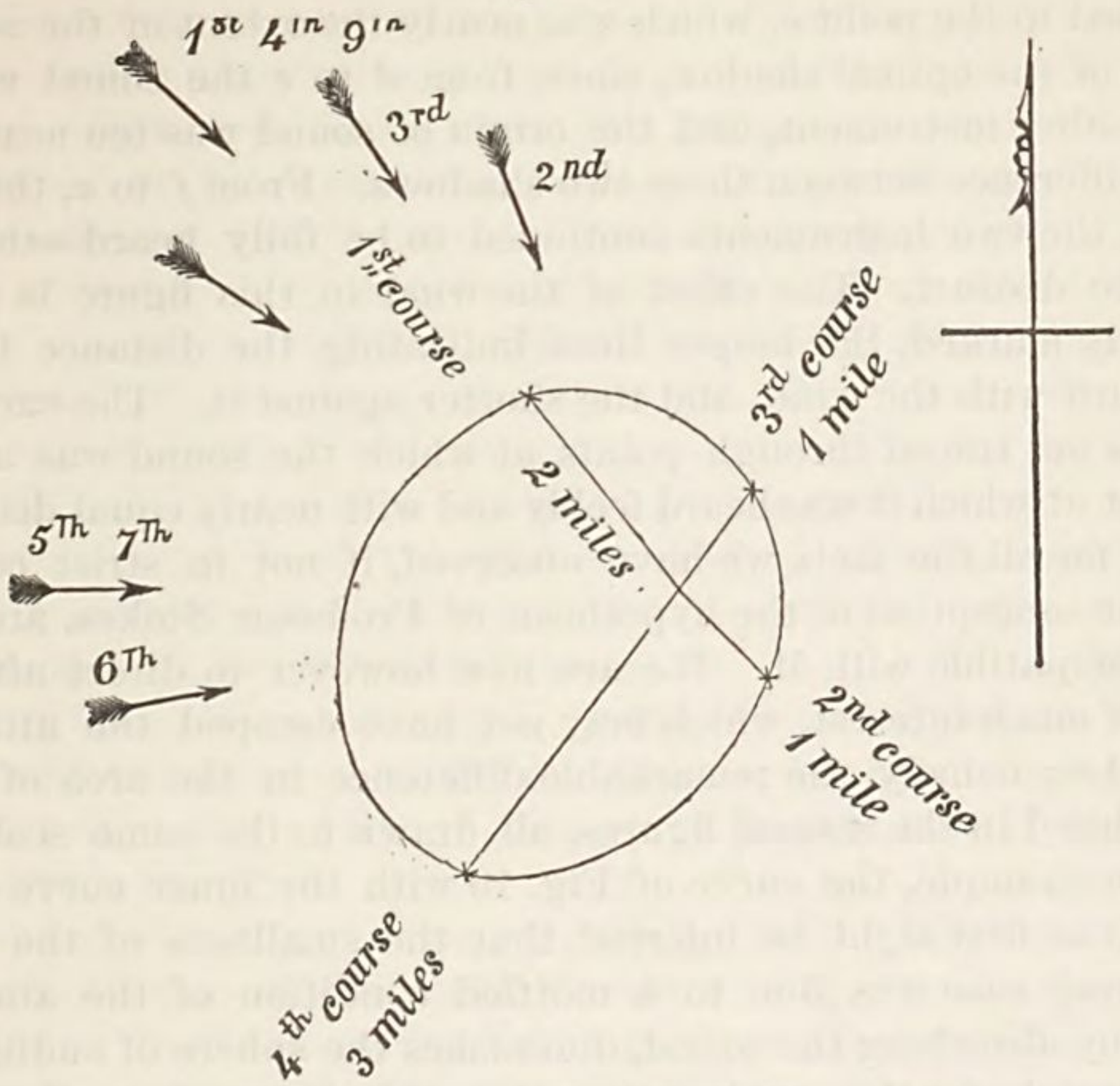
Fig. 10.



Experiments of September 7.—Barometer, 30.1 inches; thermometer, dry-bulb, 73° F. wet-bulb, 62°; wind, eight miles per hour above, and five miles per hour below, tower. The wind was variable, as indicated by the letting-off of balloons, which however did not rise to any great height. The direction of the wind is shown in Fig. 11 by arrows. There is nothing remarkable in the curve of audition of this day. It indicates, as usual, a greater distance toward the side on which the sound was moving with the wind.

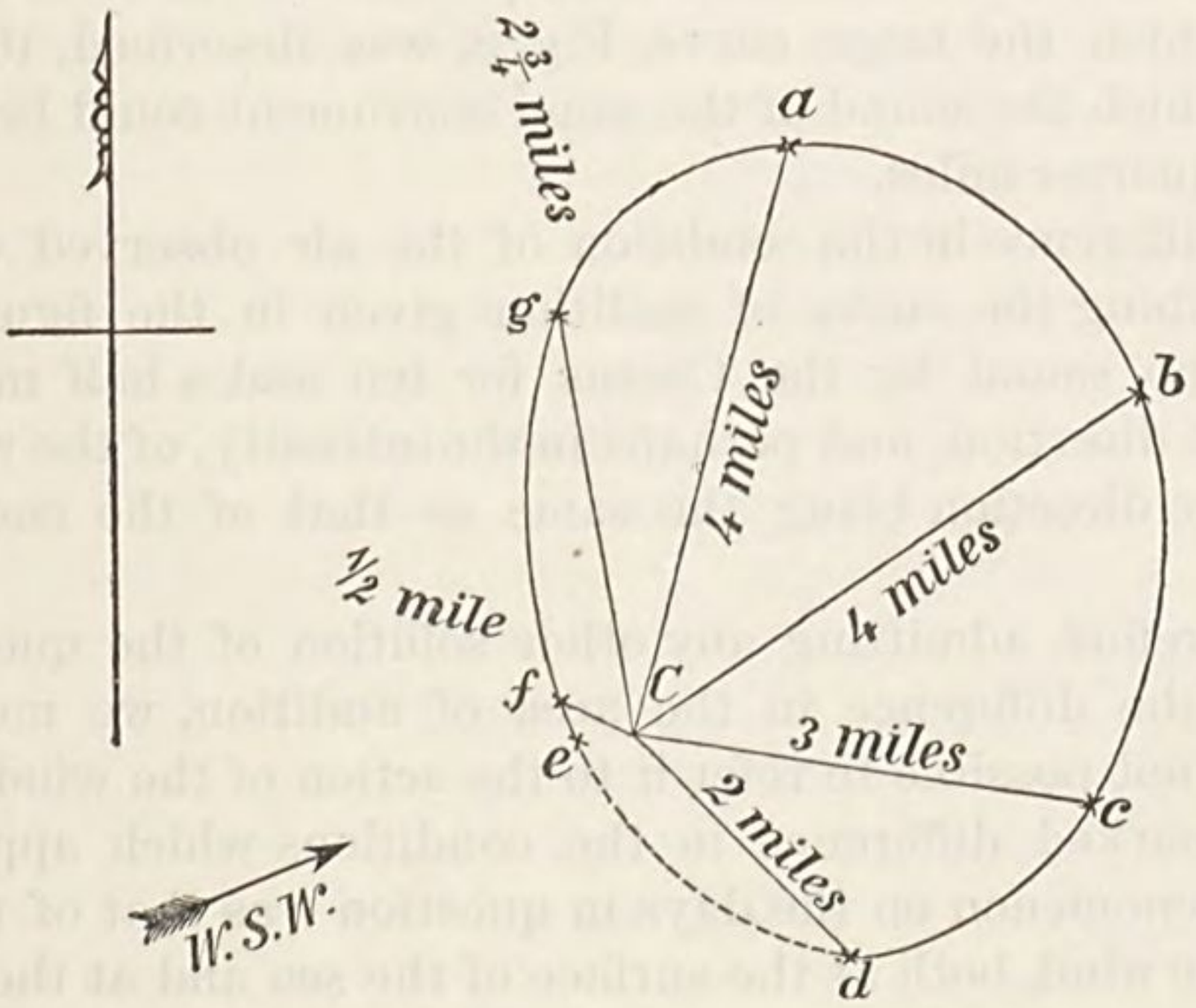
Experiments of September 8.—Barometer, 30.3 inches; thermometer, dry-bulb, 71° F. wet-bulb, 64°.5; wind, west-southwest, fifteen miles per hour at top of tower, nine miles per hour below. Fig. 12 indicates the curve of audition of the vertical siren as compared with that of the

Fig. 11.



horizontal siren. The steamer first proceeded along the line C *a* nearly in the direction of the axis of the horizontal trumpet. For the distance of the first three miles the horizontal trumpet was the louder. At the

Fig. 12.



point *a*, four miles distant, the two were distinct and very nearly equal. At *b* they were distinct, also very nearly equal, the vertical perhaps a little more distinct. At *c* very nearly equally distinct. At *d* the vertical siren was decidedly more distinct just before entering the optical

shadow of the light-house tower and the keeper's dwelling. This shadow continued to the point *e*, which was nearly the extent of the acoustic as well as of the optical shadow, since from *d* to *e* the sound was heard from neither instrument, and the origin of sound was too near to cause much difference between these two shadows. From *f* to *a*, through the point *g*, the two instruments continued to be fully heard—the vertical the more distinct. The effect of the wind in this figure is also very distinctly marked, the longer lines indicating the distance the sound was heard with the wind, and the shorter against it. The curve of this figure is not traced through points at which the sound was absolutely lost, but at which it was heard feebly and with nearly equal distinctness.

Thus far all the facts we have observed, if not in strict conformity with our conception of the hypothesis of Professor Stokes, are at least not incompatible with it. We are now however to direct attention to a fact of much interest, which may not have escaped the attention of the reader; namely, the remarkable difference in the area of audition as exhibited in the several figures, all drawn to the same scale. Compare, for example, the curve of Fig. 10 with the inner curve of Fig. 8. It might at first sight be inferred that the smallness of the curve in the former case was due to a mottled condition of the atmosphere, which, by absorbing the sound, diminishes the sphere of audition; but, unfortunately for this explanation, it would appear from the observations made by the Cactus within the hour of obtaining the data for describing the curve, that the air was then in a remarkably favorable condition for the transmission of sound, since it was heard ten and a half miles, the ordinary limit of the maximum penetrating power of the instrument—a siren of the second order; while on the 3d of September, the day on which the large curve, Fig. 8, was described, the greatest distance at which the sound of the same instrument could be heard was eight and a quarter miles.

The only difference in the condition of the air observed during the time of describing the curve of audition given in the figure, and the hearing of the sound by the Cactus for ten and a half miles, was a change in the direction, and perhaps in the intensity, of the wind, in the latter case the direction being the same as that of the course of the Cactus.

Before therefore admitting any other solution of the question as to the cause of the difference in the area of audition, we must inquire whether it is not possible to refer it to the action of the wind itself.

The most marked difference in the conditions which apparently affected the phenomenon on the days in question was that of the greater velocity of the wind, both at the surface of the sea and at the top of the tower, and by comparing the several figures in regard to the wind it will be seen that where the condition of the air was nearest that of a calm the larger was the curve of audition, and the nearer the figures approach to a circle, of which the point of origin of sound or the point

of perception is the center. From these facts we are inclined to think that sound is not heard as far during a time of high wind in any direction as it is during a perfect calm, and that it is heard farthest with a gentle wind. This conclusion, which was not anticipated at the beginning of these investigations, is we think in strict conformity with the hypothesis adopted. In the case of sound moving against a strong wind, the sonorous waves being thrown up above the ears of the observer, the sphere of audition in that direction is without question greatly diminished; and that it should be also diminished when sound is moving with a strong wind having a greater velocity above than below is not difficult to conceive. In this case the sound-wave will be so thrown down against the earth, and so much of it absorbed, as to weaken the intensity of that part which reaches the ear, while in the case of a feeble wind, moving faster above than below, the portion of the wave thrown down from above will only be sufficient to compensate for the smaller loss by friction, and thus the sound may be heard at a greater distance than in still air. But on this point, as well as others, further experiments are required.

While we consider the wind as the principal agent in producing the abnormal phenomena of sound, we do not by any means regard it as the sole agent. Prof. Osborn Reynolds, of Owens College, Manchester, without any knowledge of what was doing in America on this subject, instituted a series of experiments on the effect of wind upon sound, and finally adopted precisely the same hypothesis which we have used for generalizing the observed phenomena. He has however in a very ingenious and important paper, presented to the Royal Society in 1874, extended the same principle to the effect of heat in changing the form of the sound-wave, and has shown, both by reasoning and experiment, that the normal direction of the sound-wave in still air, instead of proceeding horizontally should be turned upward, on account of the greater velocity of sound near the earth, due to the greater heat of the strata in that position than of those above. This principle, which indicates the existence of a true refraction of sound independent of the motion of the medium, is undoubtedly applicable as a modifying influence to the phenomena we have recorded. It produces however only a slight effect in the case we have last mentioned, since the observation on board the Cactus shows the condition of the air was that of little acoustic absorption. It would nevertheless favor the hypothesis that sound in perfectly still air of homogeneous density could be heard farther than sound in a moving medium, or in one of unequal temperature. This is also in accordance with the fact repeatedly observed in arctic regions, in which the sound of the human voice is heard at great distances during times of extreme cold. In this case, the air is of a uniform temperature above and below, but of diminished elasticity, and should, on this account, transmit sound with less intensity; and yet the audibility is increased, which is explained by the assumption that its stillness and

uniformity of temperature more than compensate for the diminished elasticity. The same may be said with regard to the audibility of sound during a fog, which usually exists during extreme stillness of the air.

Whatever be the cause of the variation in the limit of audition as exhibited in the diagrams, it is less efficient than the ordinary action of the wind in producing the same phenomena. This is evident from the fact that while the ratio of the extreme variation in the limits of audition in the first case is not more than 1:3, in the second it is that of 1:5.

Moreover, when the effect of the wind on the audition of sound in relation to elevation is considered, we think we are fully warranted in asserting, as we did in our last report, that the wind is a more efficient cause of the variability of the penetration of sound than the invisible acoustic clouds adopted by Professor Tyndall for the explanation of the phenomena.

The object of these investigations, as stated at the beginning of this report, was to obtain facts which might serve to establish the true theory of the abnormal phenomena of sound, an object, independent of its scientific interest, of much practical importance in its application to fog-signals. Although the observations were not as perfect as we could wish in many respects, from want of certain appliances, they are yet sufficient we think to establish principles of much practical value. For example, if the mariner in approaching a fog-signal while the wind is blowing against the sound fails to perceive it on deck, he will probably hear it by ascending to the mast-head; or, in case a sound from a given station is constantly obscured in a certain direction, while it is audible in adjacent directions, we may attribute it to a sound-shadow produced by some interposing object. If again, the obscuration of sound in a given direction is only observed during a wind moving against the sound, the cause will probably be found in a lateral refraction, due to the retardation of the current of wind against a perpendicular wall or cliff, as in the case observed at Block Island, August 19. The subject however is one of great complexity, and requires further investigation, but the results thus far obtained may be considered as furnishing the preliminary data on which to found more precise observations. These should be made with the aid of a number of steamers simultaneously employed, each furnished with anemometers and balloons for determining with more accuracy the direction and velocity of the wind.

We hope to renew the investigations during next summer, and in view of this have directed that in the mean time the light-keepers at Block Island and at Point Judith shall continue to sound their sirens a certain length of time every Monday, noting the direction and velocity of the wind, the temperature and pressure of the air, and the audibility of the sound as it comes reciprocally from each instrument.

It is shown, from the results thus far obtained from these reciprocal observations, that sound is occasionally heard more distinctly against

the wind than in a contrary direction. We think however that these instances are generally followed by a change in the direction of the wind at the surface of the earth.

LIGHT-HOUSE BOARD, *October*, 1875.

PART V.—INVESTIGATIONS IN 1877.*

On account of the occurrence of the Centennial Exhibition, which absorbed most of the time of the officers of the Light-House Board not devoted to ordinary light-house service, but few observations were made relative to sound in 1876, and an account of what were made is incorporated in the following report.

Agreeably to previous engagement, I visited Portland, Me., to make some investigation in regard to an abnormal phenomenon of sound, which was noticed in a former report. We left Portland on the afternoon of September 3, 1877, in the steamer Iris, which had been fitted up during the year under the direction of the inspector, Commander H. F. Picking, and was in excellent condition, and well adapted to the duty of a light-house tender. The party consisted of General J. C. Duane, engineer of the first district; Commander H. F. Picking, inspector of the first district; Mr. Edward L. Woodruff, assistant engineer of the third district; Mr. Charles Edwards, assistant engineer of the first district, and myself.

We first examined one of the automatic whistling-buoys invented by Mr. Courtenay, of New York. This was in place and emitting sounds at a station called Old Anthony, off Cape Elizabeth, about nine miles from Portland. On approaching it at right angles to the direction of the wind, we heard it at the distance of a mile. But the sound did not appear loud even within a few rods. It was however of considerable quantity, being from a locomotive whistle of ten inches in diameter. The instrument is operated by the oscillation of the waves, which at this time were not of sufficient height to move it vertically through a space of more than one foot. It emitted a sound at each oscillation. This invention consists of a large pear-shaped buoy about twelve feet in diameter at the water-surface, and floats about twelve feet above the same plane. In the interior of this buoy is a large tube or hollow cylinder, three feet in diameter, extending from the top through the bottom to a depth of about thirty feet below the latter. This tube is open at the bottom, but projects air-tight through the upper part of the buoy, and is closed with a plate having three orifices in it, two for letting in the air into the tube, and one between the others for letting it out to operate the whistle. These orifices are connected with three tubes which extend downward to near the level of the water, where they pass through a diaphragm which divides the cylinder into two parts.

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* From the Report of the Light-House Board for 1877.

When the buoy rises, the water in the cylinder by its inertia retains its position, and a partial vacuum is formed between the head of the column and the diaphragm, into which the air is drawn through two of the tubes, and when the buoy descends, the escape through the injection-tube being prevented by valves, it is forced out of the inner tube and actuates the whistle.

The mooring-chain, which is sixty fathoms in length, is attached to the cylinder at a point just below the buoy, and is secured to a large stone weighing about six tons. The apparatus rides perpendicularly.

The sound in this instrument is not produced merely by the difference in hydrostatic pressure of the water in the two positions of the buoy, but by the accumulated effect of impulse generated by the motion of the apparatus.

Plans have been devised, but have not yet been perfected, to condense the air in the buoy by the effect of repeated oscillations, until a valve loaded to a definite pressure would open automatically and allow the air to escape. In this way the sound from the accumulated pressure would be produced at intervals to a greater or less extent, and would serve to diversify the character of the sound so as to enable the mariner to distinguish different locations. The invention, as it is, is considered a valuable addition to the aids to navigation, has received the unqualified approbation of all navigators on this coast who are acquainted with its operation, and will probably be introduced in all countries where its merits are known. Experience has shown that it can be permanently moored in deep water, and that vessels can safely approach it within the nearest distance, and take perfect departure from it.

The Light-House Board has adopted this buoy as one of its permanent aids to navigation, and will in time introduce it at all points where its presence will be of importance to the navigator. In order to obtain reliable data as to the operations of the automatic buoy, Commander Picking has established a series of observations at all the stations in the neighborhood of the buoys, giving the time of hearing it, the direction of the wind, and the state of the sea, from which it appears that in the month of January, 1877, one of these buoys was heard every day at a station one and one-eighth miles distant; every day but two at one two and one-quarter miles distant; fourteen times at one seven and one-half miles distant, and four times at one eight and one-half miles distant. It is heard by the pilots of the New York and Boston steamers at distances of from one-fifth to five miles, and has been frequently heard by the inspector of the first light-house district at a distance of nine miles, and even, under the most favorable circumstances, fifteen miles.

We sailed around the buoy and observed the difference in the intensity of sound in regard to the direction of the wind, which was at the time a fresh breeze of from twelve to fifteen miles per hour, from the westward, the greatest intensity being apparently at points forty-five degrees on either side of the axis of the wind. The effect however was not very definitely marked, though the sound on the whole appeared to be

greater on the semi-circumference of the circle to the leeward; but the velocity of the wind was so great that the noise produced by it on the rigging of the vessel prevented the effects from being definitely observed.

Experiments have been made with this buoy carrying whistles of different sizes, the result being that a whistle of less than ten inches diameter does not give a sound which can be heard as far as one of the latter size, although it appears to the ear near by equally loud.

There is a difference between the quantity of sound and the loudness. Two sounds may be equally loud when heard near by, yet differ very much in regard to their being heard at a distance, the loudness depending upon the intensity of sound or on the amplitude of vibration of the sounding body, while the quantity of sound depends on the extent of the vibrating surface.

The size of the whistle must be limited by the quantity of air ejected at each oscillation of the buoy. The fact that the ten-inch whistle gives a sound which can be heard farther than one of eight inches appears to have a bearing on the question (the actuating force being the same) of the united effect of two sounds of the same quantity and pitch, since the sound from several parts of the circumference of the larger whistle may be considered as a union of several sounds of less quantity.

After these observations on the automatic buoy we proceeded along the coast to White Head, at the entrance of Penobscot Bay, a distance of sixty miles, which we reached at about twelve o'clock at night, and cast anchor in Seal Harbor, near the White Head light-house.

Our first operation next morning was the examination of an automatic fog-bell, invented by Mr. Close, and which has been erected by a special appropriation of Congress. It is very simple in conception, and would do good service in southern latitudes, where it would not be affected by the ice. It consists of an upright shaft thirty-two feet long, fastened to the rock beneath the water, and kept in a vertical position by a series of iron rods serving as braces. Around this shaft is a hollow metallic float, having sufficient buoyancy by the motion of the waves to elevate a vertical rod having at the upper end a rack gearing into a ratchet-wheel. By means of projecting pins on the surface of the wheel the hammer of the bell is elevated and the bell sounded at each descent of the float. This arrangement is the most simple and efficient of any of the kind of which we have any knowledge.

The objection to it is its liability to be deranged by the action of ice and the rusting of the parts from exposure to the weather.

Our next operation at this place was the examination of the remarkable abnormal phenomenon, which was the principal object of our excursion. It has been frequently observed by the captains of the steamers plying between Boston and New Brunswick, and has also been noticed on two different occasions by officers of the light-house establishment. The phenomenon, as reported by these authorities, consists

in hearing the sound distinctly on approaching the station at the distance of from six to four miles, then losing it through a space of about three miles, and not hearing it again until within about a quarter of a mile of the instrument, when it becomes suddenly audible in almost full power. This phenomenon is always noticed when the vessel is approaching the signal from the southwest, and the wind is in the same or in a southerly direction, and therefore opposed to the direction of the sound from the station, which is the case during a fog. Commander Picking, having frequently received complaints from masters of vessels as to losing the sound at this place, concluded to verify the facts by his own observation. For this purpose he embraced the opportunity of an inspection-tour in July, 1877, to approach the station from the southwest during a fog. In his own words, he heard the sound distinctly through a space of from six to four miles, then lost it and could hear nothing until within a quarter of a mile of the station, when the blast of the whistle burst forth in full sound. The wind at this time was from the southward, or against the sound. This cessation in the hearing of the sound could not have been due to the failure of the instrument to emit sound, since its operation is automatic when once started, and in this case the fog so lifted on nearing the station as to admit the observation of the puffs of steam emitted at each blast of the whistle.

On a previous occasion General Duane and Mr. Edwards on approaching the same signal from the southwest heard the sound at about six miles distance, then lost it, and did not again hear it until within about a quarter of a mile. The wind in this instance was also the same as that in the observation of Commander Picking, namely, from the southwest.

So well established was this phenomenon that General Duane attempted to remedy the evil by elevating the duplicate whistle (with which every station is provided) to a height twenty-two feet above the level of the other whistle, by placing it on the upper end of a tube. But this arrangement produced no beneficial effect.

In the morning of September 4, 1877, on which we commenced our experiments, the weather was clear, the wind west-southwest, the velocity from ten to twelve miles, remaining nearly constant during the day. Our first object was to verify by direct observation the several features of the phenomenon, and for this purpose we steamed to the southward, or directly to the windward, from the station through the region in which the abnormal phenomena had been noticed. The pressure of the atmosphere, as indicated by an aneroid barometer, was 28.9 inches. The temperature of the air was 67° Fahrenheit; that of the water at various points along our course was 58°, except at two points where the thermometer indicated 57°. This difference was too small to have any perceptible effect on the density of the rapidly moving air which was passing over the surface of the water. As we increased our distance from the signal the sound slightly diminished in loudness until the distance was between a quarter and half a mile, when it suddenly ceased

to be heard, and continued inaudible through a distance of about a mile, when it was faintly heard and continued to increase in loudness until we reached the distance of four miles; at this point it was heard with such clearness that the position of the station could be located with facility; but on proceeding farther in the same direction it appeared to diminish gradually except at one point, when a blast, as indicated by the steam issuing from the whistle, was inaudible; but on turning the vessel around the next blast was distinctly heard.

As a second experiment we retraced the same line back to the station and observed the same phenomena in a reverse order. The sound was heard the loudest at a point four miles from the station; afterward it diminished and then became inaudible through a space of two miles, and then suddenly burst forth nearly in full intensity at the distance of a quarter of a mile, and continued loud until the station was reached.

As a third experiment the same line was traversed again, the only difference in the condition of the experiment being that the whistle on the steamer was sounded every minute between the blasts of the signal at the station; and while the observers on the vessel noted the sounds from the latter, those at the station observed the sound from the former. The same phenomena as described in the previous experiments were witnessed by those on board the vessel, but on receiving the report of the observers at the station, it was found that no cessation of the sound from the steamer was observed through the whole distance traversed by the vessel. It should be noted that the whistle at the station is ten inches in diameter, actuated by a pressure of sixty pounds of steam, and that on board the vessel six inches in diameter with twenty-five pounds of steam. It appears from this remarkable result that a feeble sound passes freely through what has been called the region of silence when sent in the direction of the motion of the wind, when a louder sound does not pass in the opposite direction.

As a fourth experiment the vessel proceeded northward on the opposite side of the station to that before traversed, but in the prolongation of its previous course. The sound in this case from the signal to the observers on the vessel was with the wind, while that from the vessel to the observers at the station was against the wind. In this experiment no cessation was observed on the vessel in the hearing of the sound from the station; it was heard with varying intensity to the distance of four and a half miles, and could probably have been heard much farther had our progress not been interrupted by land. On returning to the station the observers there reported that after the vessel had left the station and was scarcely more than a hundred yards distant not a single blast of its whistle was heard. In this case the phenomena which had been observed on the southerly side of the station were exhibited in a reverse order on the northerly side.

In what may be considered the fifth experiment, the vessel being at a distance of four miles from the station on the line traversed in the first

two experiments, the sound was heard slightly. The vessel then altered its course so as to steam, as it were, around the signal, keeping at the same distance until the direction of the station from the vessel was nearly at right angles to the direction of the wind; at this point no sound was heard from the station, although it had been slightly heard at points along the curved line traversed in reaching the point mentioned. The vessel then proceeded toward the station in a straight line, but no sound was heard until it approached the latter within one-fourth of a mile. The observers at the station however heard the sound from the vessel through the whole distance.

This experiment was made to ascertain the truth of the general impression that at this place the sound was always heard better coming at right angles or across the wind than in the direction in which it was blowing. The experiment however was found in conformity with the general rule previously established, that the sound was usually heard farthest with the wind, less against the wind, and at an intermediate distance across the wind.

The primary object of these investigations is to determine the mechanical causes to which the phenomena may be referred and from which new conclusions may be deduced, to be further tested by experiment, and such definite views obtained as may be of value in the employment of fog-signals for the uses of the mariner.

For this purpose a number of different hypotheses may be provisionally adopted and each compared with the actual facts observed.

The first hypothesis which has been suggested for the explanation of the phenomena in question is that they are due to some configuration of the land; but on inspecting the Coast-Survey chart of this region it will be seen that the nearest land consists of a series of broken surfaces not rising above the ocean enough to reflect sound or in any way to produce sound-shadows in the region through which the phenomena are observed. This hypothesis therefore is inadmissible.

Another hypothesis is that of what have been called invisible acoustic clouds or portions of atmosphere existing over the water at the region of silence, which might absorb or variously refract the sound. That such a condition of a portion of the atmosphere really exists in some cases is a fact which may be inferred from well-established principles of acoustics, as well as from experimental data. They would occur especially in the case of dissolving clouds, which would be accompanied by local diminutions of temperature, and also from portions of air which have been abnormally heated by contact with warm earth. But, if the phenomena in question were produced by a cloud of this kind, its presence ought to be indicated by transmitting through it the usual set of meteorological instruments. This was done in the foregoing experiments, but no change was observed in the indications either of the thermometer or barometer. Unfortunately we had not a hygrometer in our possession, but this observation was less necessary, since from

abundant testimony it is established that the same phenomena are exhibited during a dense fog, in which all parts of the atmosphere for miles in extent must be in a homogeneous condition. Furthermore, a local cloud could not continue to exist in a given space for more than an instant while a wind was blowing with a velocity of from ten to twelve miles an hour. Again, this hypothesis fails entirely to explain the fact that this phenomenon is always observed at nearly the same place, especially during a fog, when the wind is in a southerly direction. Finally, it is impossible to conceive of a cloud so arranged as a screen producing a sound-shadow of greater intensity on one side than on the other.

Another hypothesis is that of the refraction of sound due to the action of the wind. It is an inference from well-established theory, as well as from direct observation, that the sound is refracted by the wind, that it tends to be thrown upward when moving against the wind, and downward with the wind. This result is attributed very properly to the different velocities of the strata, that next the surface being retarded, those above being less retarded.

The upper part of the front of the wave is thus thrown backward, and the direction of the wave turned upward. In the case of the experiment south of the station, the wind passing over a long line of rough sea was moving less rapidly in its lower stratum than in the higher, and consequently the sound-wave was thrown backward above, and, as it issued from the instrument, tended to rise above the head of the observer, and at a certain distance from the origin of the sound, depending upon the difference of velocity above and below, was lost entirely to the observer, and a sound-shadow was thus produced by refraction which is closed in again by the lateral spread of the sound at a given distance.

In the experiment on the other side of the signal, the vessel proceeding to the north, the wind coming to the observer on the vessel had to pass over a rougher surface than that of water, and consequently the difference of velocities above and below, and therefore the refraction would be greater, and consequently the sound from the vessel was almost entirely lost to the observer at the station, while the sound from the station was heard uninterruptedly on the vessel, since it was moving with the wind.

On examining the records of experiments of previous years, I find a number of cases recorded where sounds were heard at a greater distance, while inaudible at a less distance, especially one in connection with the fog-signal at Gull Island, in 1874. In this case the sound, in passing from the signal, was heard distinctly at the distance of about two miles against the wind, then lost for a space of about four and a half, and heard again distinctly for a distance of perhaps one mile. At the same station, during the experiments of 1875, the sound of the whistles of the steamers was heard for a certain distance, then ceased to be heard for a considerable interval, and was then heard again. Furthermore, the pilots of the steamboats from New York to Boston report

that the automatic buoy is found to intermit its sound, being heard at a distance, then becoming inaudible, and heard again as the steamer approaches the source of sound.

From all the facts which we have gathered on this subject, I think it highly probable that in all cases in which sound moving against the wind is thrown up above the head of the observer it tends to descend by the lateral spread of the sound-wave and to reach the earth at a distance; the conditions however for the actual production of this effect are somewhat special, and will depend upon the amount of the initial refraction and the quantity of the sound-waves. Besides the lateral spread of the sound-wave there are two other causes sufficient, in certain cases, to bring a portion of the sound-waves which have been elevated in the air back again to the earth: the first is when an upper current of wind is moving in an opposite or approximately opposite direction to that at the surface of the earth, in which case an opposite or downward refraction would take place; and the second is the case in which the surface-wind is terminated above by strata of still air; in this case, also, a reverse refraction, but of less amount, would take place, which would tend to bring the sound-wave downward.

We can readily imagine that an isolated island, cooled by the radiation of the heat by night, would send every morning, in all directions, a current of cold air from its center. In this case, the sound from a whistle placed in the center of the island would be inaudible in a space entirely surrounding it, and thus give rise to a condition mentioned by General Duane, in which a fog-signal appeared to be surrounded by a belt of silence.

The next experiment was made on the morning of the 5th, on leaving the station. In this case we proceeded along the direction of the same line in which the first, second, and third experiments were made the day before. The wind had changed about four points to the southward. As in the preceding experiments, the sound was lost again at the distance of about one-fourth of a mile, but was not distinctly regained, though some of the observers thought they heard it at a distance of two and one-half miles.

The only perceptible difference in the wind on the 5th was that it was a little less rapid, and four points more to the southward.

From a subsequent report of the keepers, the whistle of the vessel was heard continuously as far as the puffs of steam could be observed, a distance six or seven miles. In this case the sound was moving with the wind. These results therefore are in accordance with those previously obtained.

The next experiments were made at Monhegan, an island sixteen miles southwest of White Head. On this island there is a Daboll trumpet actuated by a hot-air engine.

We departed from this station in a westerly direction at an angle of

45° to the right of the direction of the wind, and after proceeding about one mile, as estimated by time, we lost the sound of the signal. We then turned at right angles to our former course and proceeded toward the leeward, keeping about the same distance from the signal, when the sound was regained at a point which probably depended upon the direction of the wind and the axis of the trumpet combined. From this point it was heard to a point to the leeward, and thence we retraced our course at about the same distance and proceeded across the axis of the trumpet toward the windward, where the sound was again lost. The only definite result from this experiment was another case of the sound being heard farther to the leeward than to the windward.

After this experiment we returned to Portland.

An interesting fact may be mentioned in connection with this station, having a bearing upon the protection of light-houses from lightning. The fog-signal is placed on a small island separated from the large island by a water-space of about one-eighth of a mile. General Duane, desiring to connect the light-house and fog-signal by an electrical communication, suspended a wire between the two points and attempted to form a ground connection by depositing a plate of metal in the ground on each island, but to his surprise, though the arrangements were made by a skilled telegrapher, no signal would pass. The two islands being composed of rock and the soil limited in thickness, the conduction was imperfect, and it was only by plunging the plate of metal into the water on each side of the space between the two islands that a signal could be transmitted.

No further experiments on sound were made during this excursion, because the vessel could no longer be spared from more pressing light-house duty in the way of inspection and the stated supply of materials to the stations.

On my return to New York, accompanied by Mr. Woodruff, I took the route by the Western Railway to the Hudson River at Troy. This line was chosen in order to make some investigations relative to any peculiarities of sound which might be observed in the Hoosac tunnel, through which the railroad passes. For this purpose we spent a day at East Windsor, a village situated near the west end of the tunnel, and were very cordially received by the engineers in charge.

The tunnel is four and three-quarters miles in length, twenty-four feet wide, and twenty feet high to the crown of the arch. It ascends slightly from either end to a point near the center, where there is a ventilating-shaft 1,028 feet high extending to the outer air above. In winter, when the external temperature is less than that within the tunnel, there is a constant current from each end toward the center, and in the summer, when the temperatures are reversed, there is a current out of the tunnel at either end, except when the external wind is sufficiently strong, especially from the west, to reverse the direction of the current from one

half and direct the stream entirely out of the other entrance. At the time of our visit, there was a gentle current flowing out of both ends.

The only peculiarity of sound which had been observed, as stated by the engineers, was that it was greatly stifled at the time by the smoke with which the air was filled immediately after the passage of a locomotive. So great was this in some cases that accidents were imminent to the workmen, who are constantly occupied in the tunnel in lining the crown of the arch with brick, by the sudden appearance of a locomotive, the approach of which had not been heard.

That the audibility of sound should be diminished by smoke was so contrary to previous conceptions on the subject, since sound is not practically interrupted by fog, snow, rain, or hail, that I was induced to attribute the effects which had been observed to another cause, and to regard the phenomenon as due to an exaggerated flocculent condition of the air in the tunnel; adopting in this instance the hypothesis advanced by Dr. Tyndall, and so well illustrated by his ingenious experiments. The effect which would be produced in the condition of the air in the tunnel by the passage of a locomotive is indicated by the appearance of the emitted steam extending behind the smoke-stack of a locomotive in rapid progress before the observer at a distance. This consists of a long stream composed of a series of globular masses produced by the successive puffs of steam which are emitted at equal intervals. Allowing the diameter of the driving-wheels to be five feet, then since four puffs are made at each revolution of the wheels, a puff of hot steam would be given out at every four feet travelled by the engine, and these puffs mingling with the air at the ordinary temperature would produce an exaggerated flocculent condition. On our expressing a desire to witness the effect upon sound of the passage of a locomotive through the tunnel, Mr. A. W. Locke, one of the engineers who had charge of the western section, politely offered us the means of experimenting on this point, and also of passing leisurely through the tunnel on a hand-car.

To observe the effect of a locomotive on the sound we took advantage of the entrance of a freight train, impelled by two engines, the extra one being necessary to drive the load up the inclined plane to the middle of the tunnel, where it was detached and returned along the same line, while the train was drawn the remaining distance along the eastern decline by a single engine. In order to make the experiment with regard to sound the time was accurately noted during which the noise of the entering engines could be distinctly heard, which would give approximately the distance the sound travelled through the flocculent atmosphere produced by the locomotive before becoming inaudible, and again the time was noted from the first hearing of the returning engine until it reached the end of the tunnel. In the mean time the current of air blowing through the tunnel had removed a considerable portion, at least, of the flocculent atmosphere, so that the seund in this case came

through an atmosphere of comparative uniformity of temperature, or one much less flocculent than the other; the result was that the duration of sound in the first case was about a minute, while in the second it was upward of two minutes. The darkness in the tunnel, on account of the smoke, was so profound immediately after the passage of a locomotive, that with two large torches, charged with mineral oil, the sides of the tunnel at a distance of six feet could scarcely be observed; while in the other half of the tunnel, where no smoke existed, the eastern opening could be observed like a star in the distance of upward of two miles. It was therefore not surprising that the stifling of the sound which was observed should be referred to the smoke as a palpable cause, and that the more efficient one of the varying density or flocculent condition should be disregarded.

The method of determining by experiment the question as to which of these causes was the efficient one did not occur to me until we had left the tunnel, and then the simple expedient suggested itself to me, for the purpose of repeating the experiment, that instead of locomotives charged with wood, two locomotives charged with charcoal or coke—which emit no smoke, but only transparent gases principally carbonic acid—should be used in an experiment similar to the one just described. This experiment Mr. Locke has kindly promised to perform as soon as a convenient opportunity shall occur.

The opportunity was embraced while at the mouth of the tunnel to make some observations which might have a bearing upon the phenomena of the aërial echo. For this purpose, advantage was taken of a large tool-chest, which happened to be placed about twenty or thirty feet within the western mouth of the tunnel. By slamming down violently the cover of this chest, a loud sound of an explosive character was produced, from which a prolonged echo was returned from the interior of the tunnel. This echo was slightly intermittent, suddenly increasing in loudness at intervals for a moment, and again resuming its uniform intensity. This effect was attributed to projecting pieces of rock in that part of the tunnel which had not been lined with brick. An echo was however evidently returned from that portion of which the sides were not projecting, which I would consider an effect of the same cause which produces the aërial echo.

Aërial Echoes.

During the year 1877, (as also in 1876,) series of experiments were made on the aërial echo, in which I was assisted—in the first series by General Woodruff, engineer of the third light-house district,—and in the second series by Edward Woodruff, assistant engineer of the same district. These experiments were made principally at Block Island, but also at Little Gull Island. Especial attention has been given to this phenomenon, which consists in a distinct echo from the verge of the horizon in the direction of the prolongation of the axis of the trumpet

of the siren, because the study of it has been considered to offer the easiest access to the solution of the question as to the cause of all the abnormal phenomena of sound, and also because it is in itself an object of much scientific interest.

In my previous notice of this phenomenon, in the report of the light-house board for 1874, I suggested that it might be due to the reflection from the crests of the waves of the ocean; but as the phenomenon has been observed during all conditions of the surface of the water, this explanation is not tenable.

Another hypothesis has been suggested, that it is due to a flocculent condition of the atmosphere, or to an acoustic invisible cloud, of a density in different parts differing from that of the general atmosphere at the time. To test this hypothesis experimentally, the large trumpet of the siren was gradually elevated from its usual horizontal position to a vertical one. In conception, this experiment appears very simple, but on account of the great weight of the trumpet, it required the labor of several men for two days to complete the arrangements necessary to the desired end. The trumpet, in its vertical position, was sounded at intervals for two days, but in no instance was an echo heard from the zenith, but one was in every case produced from the entire horizon. The echo appeared to be somewhat louder from the land portion of the circle of the horizon than from that of the water. On restoring the trumpet to its horizontal position, the echo gradually increased on the side of the water, until the horizontal position was reached, when the echo, as usual, appeared to proceed from an angle of about twenty degrees of the horizon, the middle of which was in the prolongation of the axis of the trumpet. A similar experiment was made with one of the trumpets of the two sirens at Little Gull Island. In this case the trumpet was sounded in a vertical position every day for a week with the same result. On one occasion it happened that a small cloud passed directly over the island on which the light-house is erected, and threw down on it a few drops of rain. At the moment of the passage of this cloud the trumpet was sounded, but no echo was produced.

From these experiments it is evident that the phenomenon is in some way connected with the plane of the horizon, and that during the continuance of the experiment of sounding the trumpets while directed toward the zenith no acoustic cloud capable of producing reflection of sound existed in the atmosphere above them.

Another method of investigating this phenomenon occurred to me, which consisted in observing the effects produced on the ears of the observer by approaching the origin of the echo. For this purpose, during the sounding of the usual interval of twenty seconds of the large trumpet at Block Island, observations were made from a steamer which proceeded from the station into the region of the echo and in the line of the prolongation of the axis of the trumpet, with the following results:

1. As the steamer advanced, and the distance from the trumpet was

increased, the loudness of the echo diminished, contrary to the effect of an echo from a plane surface, since in the latter case the echo would have increased in loudness as the reflecting surface was approached, because the whole distance travelled by the sound-wave to and from the reflector would have been lessened. The effect however is in accordance with the supposition that the echo is a multiple sound, the several parts of which proceed from different points at different distances of the space in front of the trumpet, and that as the steamer advances toward the verge of the horizon, it leaves behind it a number of the points from which the louder ones proceed, and thus the effect upon the ear is diminished as the distance from the trumpet is increased.

2. The duration of the echo was manifestly increased, in one instance, from five seconds, as heard at the mouth of the trumpet, to twenty seconds.

This would also indicate that the echo is a multiple reaction of varying intensities from different points, and that at the place of the steamer the fainter ones from a greater distance would be heard, which would be inaudible near the trumpet.

3. The arc of the horizon from which the echo appeared to come was also increased in some cases to more than three times that subtended by the echo at the place of the trumpet. This fact again indicates that the echo consists of multiple sounds from various points at or near the surface of the sea, the angle which the aggregate of these points subtend necessarily becoming greater as the steamer advances.

But perhaps the most important facts in regard to the echo are those derived from the series of observations on the subject, made by Mr. Henry W. Clark, the intelligent keeper of the principal light-house station on Block Island, and by Joseph Whaley, keeper of the Point Judith light-house. Mr. Clark was furnished with a time-marker to observe the duration of the echo, and both were directed to sound the trumpets every Monday morning for half an hour, noting the temperature, the height of the barometer, the state of the weather as to clearness or fog, the direction and intensity of the wind, and the surface of the ocean.

From the observations made at these two points, for more than two years at one station and over a year at the other, the echo may be considered as produced constantly under all conditions of weather, even during dense fogs, since at Block Island it was heard 106 times out of 113, and at Point Judith 50 times out of 57, and on the occasions when it was not heard the wind was blowing a gale, making a noise sufficiently intense to drown the sound of the echo. These results appear to be sufficient to disprove the hypothesis that the phenomenon is produced by an acoustic cloud accidentally situated in the prolongation of the axis of the trumpet. It must be due to something more permanent in its effects than that from a portion of air differing from that of the general atmosphere in temperature or density, since such a condition cannot exist in a dense fog embracing all the region of the locality of the phe-

nomenon. Indeed, it is difficult to conceive how the results can be produced, even in a single instance, from a flocculent portion of atmosphere in the prolongation of the axis of the trumpet, since a series of patches of clouds of different temperature and densities would tend to absorb or stifle by repeated reflections a sound coming from their interior rather than to transmit it to the ear of the observer.

The question, therefore, remains to be answered: what is the cause of the aërial echo? As I have stated, it must in some way be connected with the plane of the horizon. The only explanation which suggests itself to me at present is that the spread of the sound which fills the whole atmosphere from the zenith to the horizon with sound-waves may continue their curvilinear direction until they strike the surface of the water at such an angle and direction as to be reflected back to the ear of the observer. In this case the echo would be heard from a perfectly flat surface of water, and as different sound-rays would reach the water at different distances and from different azimuths, they would produce the prolonged character of the echo and its angular extent along the horizon.

While we do not advance this hypothesis as a final solution of the question, we shall provisionally adopt it as a means of suggesting further experiments in regard to this perplexing question at another season.

General Conclusions.

From all the experiments which have been made by the Light-House Board in regard to the transmission of sound in free air and those derived from other observations which can be fully relied upon, the following conclusions may be considered established, subject however to such further modification and extension as subsequent investigation may seem to indicate:

1. The audibility of sound at a distance (the state of the atmosphere being constant) depends upon the character of the sound. The distance through which a sound may be heard is governed by the pitch, the loudness, and the quantity of sound. The pitch or frequency of the impulses in a given time must not be too high, otherwise the amplitude of vibration will be too small to allow a sufficient quantity of air to be put into motion; neither must the pitch be too low, for in this case the motion of the atoms of air in the sound-wave will not be sufficiently rapid to convey the impulse to a great distance. Again, the greater the loudness of the sound, which depends upon the amplitude of the vibrations of the sounding-body, the greater will be the distance at which it will be heard. And finally, the greater the quantity of sound, which depends upon the magnitude of the vibrating surface, the greater will be the distance to which it is audibly transmitted. These results are derived from observations on the siren, the reed-trumpet, and the automatic buoy. The effect of quantity of sound is shown in the fact that in sounding different in-

struments at the same time, it was found that two sounds apparently of the same loudness were heard at very different distances.

2. The audibility of sound depends upon the state of the atmosphere. A condition most favorable to the transmission of sound is that of perfect stillness and uniform density and temperature throughout. This is shown by the observations of Parry and other Arctic explorers; although in this case an efficient and co-operating cause is doubtless the downward refraction of sound due to the greater coldness of the lower strata of air, as first pointed out by Professor Reynolds. Air however is seldom in a state of uniform density, but is pervaded by local currents, due to contact with portions of the earth unequally heated, and from the refractions and reflections to which the sound-wave is subjected in its passage through such a medium it is broken up and lost to the ear at a less distance.

3. But the most efficient cause of the loss of audibility is the direct effect produced by the wind. As a general rule, a sound is heard farther when moving with the wind than when moving against it. This effect, which is in conformity with ordinary observation, is not due to an increase of velocity of the sound-wave in one direction and a diminution in the other by the motion of the wind except in an imperceptible degree; for since sound moves at the rate of about seven hundred and fifty miles an hour, a wind of seven miles and a half an hour could increase or diminish the velocity of the sound-wave only one per cent. while the effect observed is in some cases several hundred per cent. It is however due to a change in its direction. Sound moving with the wind is refracted or thrown down toward the earth; while moving against the wind it is refracted upward and passes over the head of the observer, so as to be heard at a distance at an elevation of several hundred feet when inaudible at the surface of the earth.

4. Although, as a general rule, the sound is heard farther when moving with the wind than when moving against it, yet in some instances the sound is heard farthest against the wind; but this phenomenon is shown to be due to a dominant upper wind, blowing at the time in an opposite direction to that at the surface of the earth. These winds are not imaginary productions invented to explain the phenomena, but actual existences, established by observation, as in the case of the experiments made at Sandy Hook, in 1874, by means of balloons, and from the actual motion of the air in the case of northeast storms, as observed at stations on the coast of Maine.

5. Although sound issuing from the mouth of a trumpet is at first concentrated in a given direction, yet it tends to spread so rapidly that at the distance of three or four miles it fills the whole space of air inclosed within the circuit of the horizon, and is heard behind the trumpet nearly as well as at an equal distance in front of its mouth. This fact precludes the use of concave reflectors as a means of increasing the intensity of sound in a given direction; for although at first they do give an increase

of sound in the direction of the axis, it is only for a comparatively short distance.

6. It has been established, contrary to what has formerly been thought to be the case, that neither fog, snow, hail, nor rain, materially interferes with the transmission of loud sounds. The siren has been heard at a greater distance during the prevalence of a dense and widely-extended fog than during any other condition of the atmosphere. This may however be attributed to the uniform density and stillness of the air at the time.

7. In some cases sound-shadows are produced by projecting portions of land or by buildings situated near the origin of the sound, but these shadows are closed in by the spread of the sound-waves, and thus exhibit the phenomenon of sound being heard at a distance and afterwards lost on a nearer approach to the station.

8. It frequently happens on a vessel leaving a station, that the sound is suddenly lost at a point in its course, and after remaining inaudible some time, is heard again at a greater distance, and is then gradually lost as the distance is farther increased. This phenomenon is only observed when the sound is moving against the wind, and is therefore attributed to the upward refraction of the sound-wave, which passes over the head of the observer and continues an upward course until it nearly reaches the upper surface of the current of wind, when the refraction will be reversed and the sound sent downward to the earth; or the effect may be considered as due to a sound-shadow produced by refraction, which is gradually closed in at a distance by the lateral spread of the sound-wave near the earth, on either side, in a direction which is not affected by the upward refraction. Another explanation may be found in the probable circumstance of the lower sheet of sound-beams being actually refracted into a serpentine or undulating course, as suggested in the Appendix to the Report of the Light-House Board for 1875. (See page 513.) Such a serpentine course would result from successive layers of unequal velocity in an opposing wind; as being retarded at and near the surface of the earth, attaining its maximum velocity at a height of a few hundred feet, and then being again retarded at greater elevations, by the friction of upper counter currents or stationary air. In some cases the phenomenon is due to one or the other of these causes, and in other cases to all combined. That it is not due to the obstructing or screening effects of an abnormal condition of the atmosphere is shown by the fact that a sound transmitted in an opposite direction, through what is called the region of silence, passes without obstruction. It is probable from all the observations, that in all cases of refraction of a sound moving against the wind it tends again to descend to the earth by the natural spread of the sound.

9. The existence of a remarkable phenomenon has been established, which is exhibited in all states of the atmosphere during rain, snow, and dense fog, to which has been given the name of aërial echo. It consists

of a distinct echo, apparently from a space near the horizon of fifteen or twenty degrees in azimuth, directly in the prolongation of the axis of the trumpet. The loudness of this echo depends upon the loudness and quantity of the original sound, and therefore it is produced with the greatest distinctness by the siren. It cannot be due to the accidental position of a flocculent portion of atmosphere, nor to the direct reflection from the crests of the waves, as was at first supposed, since it is always heard except when the wind is blowing a hurricane.

As a provisional explanation, the hypothesis has been adopted that in the natural spread of the waves of sound, some of the rays must take such a curvilinear course as to strike the surface of the water in an opposite direction and thus be reflected back to the station or location of the origin of the sound.

LIGHT-HOUSE BOARD, *October*, 1877.

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